

DISCOVERY

A Monthly Popular Journal of Knowledge

Vol. XIV. No. 166.

OCTOBER, 1933

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Trustees: SIR J. J. THOMSON, O.M., F.R.S., SIR F. G. KENYON, K.C.B., F.B.A., PROFESSOR A. C. SEWARD, Sc.D., F.R.S., PROFESSOR R. S. CONWAY, Litt.D., F.B.A.

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Notes of the Month.

THE arrangement of the time-table for the British Association meeting is an immense task. Over three hundred addresses are delivered during the week and the organizers can scarcely hope to suit the convenience of all the members. But the cheerful abandon with which many speakers exceeded their time-limit caused unnecessary inconvenience to members interested in more than one subject. Moreover, there was rarely time for the discussion of a paper, which is often as interesting as the address itself. That increasing specialization in science tends to result in undesirable segregation is not a new reflection, but the tendency is always conspicuous at the meeting of the British Association. This has prompted *The Times* to describe it as almost a series of distinct congresses meeting for convenience in the same city at the same time. Whatever may be the disadvantages of this tendency, probably few of the members are unduly upset about it, for it is well known that the specialist is blissfully unaware that other subjects exist. A large measure of segregation is inevitable, for if the sectional proceedings did not take place simultaneously the meeting would last for six months.

It has long been thought that Mount Nebo—the Biblical Pisgah from which Moses viewed the Promised Land—would repay excavation, and the announcement

that important discoveries have been made is not unexpected. The work has been carried out by the Biblical Institute of the Franciscan Convent in Jerusalem, and the remains of an early Christian church have been unearthed at the summit of the mount. It is thought to be the sacred building referred to by the nun St. Sylvia of Aquitaine who visited Palestine in 386-388, the existence of the church being corroborated by other pilgrims. According to a communiqué, mosaic work in a good state of preservation has been discovered by the altar, bearing likenesses of animals and floral decorations, with a central design which is believed to depict the Ark with a lion on one side and a bull on the other and a gazelle with a bell at either end. The altar is thought either to mark the spot from which Moses viewed the Promised Land or else his burial place. Below the altar is a Greek inscription which may be difficult to decipher as some of the letters are missing, but it is at present thought to refer to the Bishops of the Church. Another building has been found to contain an excellently preserved mosaic pavement bearing an inscription in Greek which contains a reference to Lot, and including representations of Lot's two daughters. Further excavation should throw important new light on these events in Biblical history.

* * * * *

The study of migration is an important branch of the ornithologist's work, and the value of systematic observation has frequently been stressed in this journal. An experiment recently carried out at Essen is of special interest, for we believe that it is the first serious attempt to study the migration of storks. The birds, which were born and bred in Prussia, were released in the morning, but it was late evening before they became sufficiently accustomed to their freedom to take to the air. They occupied the day in catching frogs and other peaceful pursuits. When they eventually moved off they separated into two distinct groups and circled many times round their starting point. Towards dusk they flew away, but to the surprise of watchers they returned the next morning to await better weather. It was

expected that a week or two would elapse before the storks made a definite start on their journey. Three groups of twenty, fifty and sixty-two birds have eventually left Essen, but several seem to be in no haste. The birds had been kept in the city for four weeks before being liberated, and it is now hoped to discover whether they will follow the customary route of their ancestors to their winter quarters in Africa; this lay by way of the Balkans and Egypt. It is possible, however, that they may take a south-westerly direction through France, Spain and Morocco. Twenty storks have also been released from Frankfurt, but these birds have not yet made a definite start. The experiment is a novel one, and further observations will be interesting.

The meticulous care with which cold storage experiments are being carried out was demonstrated on the occasion of a recent visit to the laboratory of the Department of Scientific and Industrial Research at East Malling, Kent. We were shown a model ship's hold which is even equipped with an imitation sea, in the form of an air jacket. Dr. A. J. M. Smith, who is in charge of the work, hopes later to be able to reproduce the motions caused by rolling and pitching, since this is an important factor in maintaining a uniform temperature. A cargo of apples which has just been "taken on board" will be carefully watched until Christmas under varying conditions. The temperature of the "sea" may be accurately regulated so that it is possible to reproduce conditions met with either in the Tropics or in the cold regions of the North Atlantic. To study the variations in temperature, over 250 thermometers have been placed among the cargo and will be read by means of an electrical apparatus in another part of the laboratory. About five per cent of a cargo of this kind is usually wasted on an average journey, and as a normal consignment of apples consists of as many as three million boxes, the loss is considerable. Dr. Smith expects to make a considerable reduction in this figure.

If the experts are not mistaken, a fortunate Parisian has just purchased a Rembrandt for 3s. 2d. The painting is a landscape which is said to be almost identical in subject with the artist's "Skaters' Canal" which hangs in the Cassel Museum. It is painted on wood and may possibly be part of the same plank as that used for the "Blind Tobias" and "Joseph's Dream" which are in the Kaiser Friedrich Museum, Berlin. In his book on Rembrandt, Michel mentions that several studies similar to the Cassel painting have disappeared since the inventory made in 1656. The

authenticity of the portrait remains, however, to be finally proved.

In these days of luxury liners it seems incredible that many travellers in the early days of steamships preferred to cross the Atlantic in a sailing vessel because it was safer. In a letter from New York dated February 27th, 1842, Charles Dickens described the steamer which took him to America as "a damnable invention." This unpublished gem is quoted by Mr. Robert Wilt in a letter to *The Times*. "I did intend," wrote Dickens, "leaving here for Philadelphia to-morrow. But I have resolved to send my secretary and baggage on, and to linger behind until Tuesday afternoon, in the hope that the poor steamer may yet arrive in safety. It is worth remarking that I registered a vow soon after we came ashore not to return in a steamer; having observed on our passage many dangers to which those demons are peculiarly liable. Indeed, the wonder with me is how they get across in heavy weather, as they have done. Instead of riding on the tops of the waves as ships do, they cleave their passage through them, and are under water the whole time. I wish you could once—only once—hear the noise of the sea upon her deck, and feel how she stops and quivers. Oh! It is a most damnable invention out upon the wide ocean, by the ghosts of all those who went down in the 'President,' it is . . ."

The Independent, a weekly review which owes its origin to the Individualist Bookshop and the Friends of Economy, makes its debut this month, and many of our readers will look forward to the first number on October 7th. Its policy will be anti-political, and its appeal is therefore likely to be a wide one. The new review, which is edited by Sir Ernest Benn, will not be devoted entirely to finance and economics as the programme of contents for a typical issue shows: music, the stage, the churches, the screen, the family, radio, will all be treated from new points of view. The titles of some of the articles already arranged promise good value for sixpence; they include "Retrenchment and Repeal" by Sir Ernest Benn, "Roosevelt Revealed" by Dr. T. E. Gregory, "Minding Our Own Business" by E. G. Hawke, "Diplomacy and Democracy" by Lord Rendell. The lighter side will not be neglected; there will be a weekly crossword, a competition, a cartoon—and a children's page, in which Mr. Archibald Marshall "will address the children of an older age on political questions that other people regard too seriously."

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The Alphabet's Family Tree.

By William Kelly Prentice.

Epigraphical Museum, Princeton University.

The new epigraphical museum at Princeton University houses a remarkable collection of inscriptions. The development of writing from the early picture-symbols is briefly traced by Professor Prentice in the following article, reproduced by special permission from the "Princeton Alumni Weekly."

THE origin of expressing words or thoughts in writing—on paper or on any other medium—should be of interest to everyone. That is why the Princeton Epigraphical Museum was established. The inscriptions which it contains have been collected gradually during the past thirty years, and at present the museum houses about twenty-five originals, eighty-five casts, and a great many paper moulds or "squeezes." The development of different kinds of writing can be seen in them, and the relationships of most of these kinds to one another. Seventeen ancient languages are represented. Some of the documents have important historical significance; some, if printed in ordinary type, would fill one or two pages of a book.

Many systems of writing have been used. When people invent one, they commonly begin with pictures of natural objects which suggest the corresponding words. Pictures of concrete things may suggest also actions or ideas: for example, a picture of a hand, in various positions, may suggest entreaty, command, welcome, hostility. So even picture-writing can sometimes express a good deal. When such pictures are used much for writing, they tend rapidly to become conventionalized until all resemblance to the objects represented is lost. New symbols without pictorial significance are added, and the system becomes complicated, because every word must have a symbol of its own, and there are a great many words. Almost anybody can invent such a method of writing.

Often, however, word-symbols come to be used for syllables, commonly the first syllable of each original word. For example, the

symbol for the word *ma-lek* (king) can be used for the syllable *ma*. By this method it is possible with comparatively few symbols to write almost any word, because there are not nearly so many different syllables in any language as there are different words. Such a method of writing is called *syllabic*, and a good many people seem to have invented, independently, some system of syllable-writing. The discovery that there is a very limited number of elemental sounds, which in various combinations form all the words in all languages, was a great achievement. It is possible that this discovery was made only once in human history, and was acquired from its discoverer by all others who have used it. A set of twenty or thirty characters, each representing an elemental sound such as *m*, *b*, etc., by which any word whatever can be written, is an alphabet.

In the Princeton Epigraphical Museum there are two examples of writing by picture-symbols which have not been deciphered yet. One of these is a cast of the "Phaestos Disk," found in Crete, although it may not have originated there. The other is a cast from a squeeze of an inscription now in the museum at Constantinople, but found in northern Syria; probably it is the writing of some group of the people now called Hurrians, whose ancestors occupied the Nearer East before either the Sumerians or the

Akkadians entered Mesopotamia. Both these inscriptions probably belong to the period between 1000 and 2000 B.C.

As early as 4000 B.C., perhaps even earlier, the Sumerians of lower Mesopotamia had a system of written symbols



Late Cuneiform writing in Assyrian language across the top of a carving showing Jehu, King of Israel, making obeisance to the King of Assyria (841 B.C.).

composed of groups of lines and wedges. Probably the oldest of these were originally highly conventionalized picture-symbols. Later many of the symbols stood for syllables, and gradually a very practical method of writing was developed, for it was discovered that a stylus, shaped somewhat like a four-sided, unsharpened pencil, when its end was pressed into unbaked clay, made very easily and rapidly the wedge-shaped marks required: when the clay so marked was baked, the record became permanent.

Cuneiform Writing.

This is the "cuneiform" writing. It is mostly syllabic, though it contains a good many word-symbols, too. Many different languages were written in it. The royal archives found at Tell el-Amarna contained letters and documents of the early fourteenth century B.C., from kings of Babylon, of Assyria, of the Hittites, and from Egyptian governors in Syria and elsewhere, addressed to the king of Egypt, all written in cuneiform characters. This was the common method of writing in Mesopotamia until the middle of the sixth century, B.C., and later still in a modified form it was used by the ancient Persians. A specimen in the museum shows the cuneiform writing in an early stage. The inscription is in the Sumerian language, and is carved on a socket for the pivot of a door in a temple built by Entemena, king of Lagash, about 2700 B.C. Another specimen (illustrated on page 301) shows this writing in its most highly developed form. It is a copy made in London of a panel of the "Black Obelisk of Shalmaneser," now in the British Museum. The panel shows Jehu, the king of Israel, making obeisance to the king of Assyria in the year 841 B.C. or thereabouts.

About five years ago there were found at Ras Shamra in North Syria inscriptions in a genuine alphabet of twenty-six letters, made out of the simplest elements of the cuneiform characters. They are thought to belong to the last century or two before 1000 B.C. It is not likely, however, that the principle of alphabetic writing was discovered by these people of Ras Shamra; they got the idea from others who were already using an alphabet which was far better for writing with pens on paper of some sort, but was not very well suited for pressing into unbaked clay with a stylus. At Ras Shamra the old writing-materials were still in use, and perhaps the people there preferred the old wedges.

Up from the south, perhaps about 1200 B.C., or earlier, traders brought into Syria the alphabet which in a few centuries was to supersede all other forms of writing west of the Euphrates. Doubtless this

alphabet was invented in Egypt, where various kinds of writing had been in use from very early times. By 3500 B.C. the Egyptians had not only an elaborate hieroglyphic and a cursive script, but also a phonetic syllabic writing, and at least the beginning of alphabetical signs representing consonants. Something like the traders' alphabet was found recently in the Peninsula of Sinai, in roughly carved inscriptions which belong probably to the fourteenth century B.C. The alphabet was adopted by the Phoenicians, certainly before 1000 B.C., perhaps before 1200, as the inscriptions found at Byblos show. The "Moabite Stone," with its inscription by Mesha, king of Moab and vassal of Ahab, king of Israel, shows that the alphabet was used in Moab in the ninth century B.C. (See *II Kings*, 3, 4 ff.) The same alphabet was used by the Hebrews in Jerusalem while the kingdom lasted.

One piece in the museum at Princeton is a cast made directly from the wall of the tunnel to the Pool of Siloam. The language is Hebrew, and the text records that on a certain day those digging the tunnel first heard the picks of the workmen who were digging to meet them from the other end. The tunnel was probably made by Hezekiah, king of Judah, towards the end of the eighth century B.C. (See *II Kings*, 20, 20; and *II Chronicles*, 32, 2-4, and 30.) The letters of the tunnel-inscription are essentially the same as ours, though some of them have different values: for example, the sign E here has the value of our H.

This alphabet was so easy to write and read that its use spread rapidly. Each people who took it changed some of the characters, dropped some, added others, so that gradually the various forms of the alphabet came to seem rather different; but all have the same origin. From Phoenicia it spread north and west. The Lydians wrote in it. Also in the museum are casts from stelae found in Professor Howard Crosby Butler's excavations at Sardis. One of these is bilingual: identical passages are written in Aramaic as well as Lydian.

The Spread of the Alphabet.

The same alphabet is used in the inscription on a stele from the island of Lemnos: this has not been deciphered satisfactorily yet. It is the Etruscan alphabet, too. The Greeks learned it, probably from the Phoenicians, towards the end of the eighth century B.C., and used to write it as the Phoenicians did, from right to left. Later the direction of the Greek writing was changed, when pens came to be used. From the Greeks the Romans got their alphabet, and from the Romans nearly all of Europe.

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New Studies of Shakespeare.

By R. S. Conway, D.Litt., Litt.D., F.B.A.

The study of the uncertainties in the text of Shakespeare has been a favourite exercise in literary research for centuries. A new volume, here reviewed by Professor Conway, throws interesting new light on some aspects of the subject and tells us something more of Shakespeare's character and tastes.

THE Text of Shakespeare—what dusty memories of our school days this phrase awakens! Many of those who read this will recall the feeling of chagrin with which, after having succeeded in making out, with some youthful satisfaction, the meaning of a striking bit of, say, *Hamlet* or *King Lear*, we learnt that it was quite uncertain whether this or that line was really what Shakespeare had written, and not merely what Theobald or Malone or old Dr. Johnson had guessed him to have written, in the place of some meaningless phrase which was all that the early editions contained.

The "Bad Quartos."

No doubt there was a certain interest, at first, in one or two of these puzzles; but when it came to having to remember the nonsensical readings and the guesses to remedy them at the rate of, say, one every page, schoolboy nature rebelled, and we wished the variant readings at the bottom of the sea. Yet our instructors were hardly to be blamed. They treated us mercifully, for the number of uncertainties is in fact considerably greater than schoolboys can possibly be troubled with. Rightly enough, we were told nothing about the "bad Quartos." We were not required to know that in the earliest published version of *Hamlet*, Polonius was called Corambis; nor that the opening lines of Hamlet's famous soliloquy were printed thus:

To be, or not to be, I there's the point,
To Die, to sleepe, is that all? I all:
No, to sleepe, to dreame, I mary there it goes,
For in that dreame of death, when wee awake
And borne before an everlasting Iudge
From whence no passenger ever returned,
The undiscovered country, at whose sight
The happy smile and the accursed damn'd.

And this kind of nonsense is not confined to the first Quarto of *Hamlet*. Happily we have other sources for the text of the play, but this Quarto is one; and it may almost be said that the study of Shakespeare's text has now become a subject in itself, demanding devoted and laborious service from an army of specialists in more than one country.

These reflections have been prompted by studying nine lectures delivered by Dr. Dover Wilson, Dr. W. W. Greg and others in the years 1923 to 1931 to the British Academy, and now collected in one volume

entitled, not very happily, *Aspects of Shakespeare*.* It contains several important contributions to the subject by men who are in the front rank of experts, and through whom it has been brought into new light, but also into new depths. Specialists will be grateful for the volume, at all events as an indication of the kind of help which is to be sought from the different authors in their larger publications. But even the ordinary reader, who cannot give much time or thought to such problems, will be captivated by Dr. Dover Wilson's brilliant account of "The Elizabethan Shakespeare," which in the chronological order adopted comes seventh but which might well have been put first. And the same reader will find no small enjoyment in Mr. Granville-Barker's admirable essay "From Henry V to Hamlet," written from the point of view of a distinguished actor. And he will appreciate also Professor Lascelles Abercrombie's "Plea for the Liberty of Interpreting" as a lighter handling of some elementary problems of literary criticism; though here and there it is unconvincing, as in a strangely dogmatic attempt to distinguish between what a great author "intended to do" and what "he actually did" (p. 230.) The second question, for instance, in such plays as *Hamlet* and *The Tempest*, is still the subject of widely different judgements, and it involves the first.

Shakespeare's Personality.

The ordinary reader will also find real delight, and the specialist student should certainly find some important evidence of Shakespeare's personality and interests, in Professor Caroline Spurgeon's charming essay on his "Imagery." It comes last; but it is the only one of the collection which really justifies the title, showing, for instance, the keenness of Shakespeare's senses of touch and of smell, and his abhorrence of the frowzy habits of Elizabethan homes. The rest of the nine do not deal directly with Shakespeare (with the possible exception of Professor Legouis' cheerful account of the lifelike pictures of drunkards, Falstaff, Sir Toby Belch and the rest), but only with aspects of Shakespearean study.

In the more serious work, Mr. Dover Wilson's contribution is fundamental. He insists that the

*Oxford University Press. 12s. 6d.

plays must be read as plays that were acted and made in order to be acted, and continually modified in the course of repeated acting, not written to be read as books. Other solid contributions are in the work of Messrs. Pollard, Chambers, and Greg, and include forty-eight pages (occupied by the discussion of actual variant readings) by the last named.

"Frauds of Impostors."

Dr. Greg classifies the plays according to the authority behind their text. For seventeen we depend entirely on what is called the First Folio edition, published in 1623, seven years after Shakespeare's death. These seventeen include, among the tragedies, *Macbeth*; among the histories, *King John*; among the comedies, *The Tempest*. For nine plays we have this Folio text and an earlier Quarto text from which it is clear that the Folio was printed. These include *King Lear*, *Richard III*, and *Much Ado*; and not very different is a class of three, including *Othello*, *Troilus and Cressida*, *Henry IV*, Part II, the text of which in the Folio, though not printed from the Quarto, was taken from an independent manuscript representing substantially the same version. Finally we have the difficult class of seven plays (including *Hamlet*, *Henry V*, and *Merry Wives*) of which we have two different Quarto versions; the earlier of the versions in each case is bad; and the seven were no doubt among those described in the Preface to the First Folio as "stolen and surreptitious copies, maimed and deformed by the frauds of injurious imposters."

Much of this, though not all, has been known for some time past; but the ordinary reader has little idea of the degree of corruption which the "bad" texts show; the passage quoted at the outset of this notice will serve as an example; no such example, however, is quoted in the volume itself, though most readers would welcome some concrete illustrations of the serious nature of the problems involved. It seems to be now generally believed that the "bad Quartos," as they are called, were based on the recollection of some minor actor who knew his own part much better than anything else, and who sold his attempt at constructing the text without asking anyone's leave.

Professor Pollard reckons the Second, or Intermediate, Quartos as twenty-six in number. They appeared at various dates between 1594 and 1622, and the authority of these is considerably less than that of the eighteen First Quartos, though of these the bad Quartos form a class by themselves. Dr. Greg's working hypothesis (p. 148) may be quoted:

"The theory which I wish to examine . . . is that the 'good' Second Quarto was printed direct from Shakespeare's autograph; that the Folio was printed from a playhouse manuscript (copied from that autograph) which had undergone certain alterations in the course of two decades of constant use as a prompt-book; and that the 'bad' First Quarto is in the main based upon a representation of the play, the actor's parts for which had been transcribed from the same prompt-copy in its original state."

This theory he tests by examining evidence in the seven plays *Hamlet*, *Henry V*, *King Lear*, *Othello*, *Troilus and Cressida*, *Henry IV Part II*, *Romeo and Juliet*; and the passages which bear upon it fall into five categories: "(1) those in which Q1 (i.e., the First Quarto) and F (i.e., the Folio of 1623) agree against Q2; (2) those in which Q1 and Q2 agree against F; (3) those, if any, in which Q1 preserves a correct reading where both Q2 and F are corrupt; (4) errors common to Q2 and F (Q1 being absent); and (5) errors, if any, common to all three texts."

It is only in the last two classes that conjectural emendations deserve to be considered; but unluckily these classes are numerous; and errors in the seventeen plays for which we have only the Folio are of course on a level with Class (5). Dr. Greg completely establishes what he calls his central point; "no emendation can or ought to be considered *in vacuo*; . . . criticism must always proceed in relation to what we know, or what we surmise, respecting the history of the text." That applies to all emendation in all authors; and is a sufficient answer to a rather cheap witticism of Professor Housman—his dog-and-flea theory of emendation—which has been sometimes quoted, like his beer-drinker's theory of poetry, with more respect than it either claimed or deserved.

Doctored Folios.

Of the importance of Dr. Greg's method, two simple examples may be given from *Hamlet*. We have seen how bad the First Quarto can be in this play; yet when it agrees with the Folio it is very likely to preserve an authentic reading. The phrase "fretful Porpoentine" in I v. 20 appears in the First Quarto and in the Folio; but in the Second Quarto the epithet is altered into an easier but far less expressive word "feareful." Dr. Greg suggests, very probably, that Shakespeare first wrote "feareful" and that that remained in the copy from which the Second Quarto was printed; but that the stronger epithet had been substituted by him in the roll of the actor's part from which the First Quarto was derived, and subsequently put into the official prompter's copy before that copy

was used for printing the Folio. The second is a case in which two Quartos are agreed and the Folio differs.

In these cases there is considerable probability that the Folio is either misprinted (Dr. Greg counts twenty-four such misprints in *Hamlet* only) or contains an alteration which was not made by Shakespeare. Thus in I ii.200 the First Quarto begins the line with "Armed to poynt," the Second gives the correct phrase "Armed at poynt." Both these readings make two feet, the first word having two syllables. But someone, before the Folio came to be printed, either because he did not understand the old phrase "at poynt" or because he disliked treating the *-ed* of the participle as a separate syllable, changed the reading to "arm'd at all poynts." There can be no doubt here that the Folio has been doctored.

Tricks of Spelling.

Take a third example from III ii.252, where both the Second Quarto and the Folio give us these two lines:

Thou mixture rank, of midnight weeds collected,
With Hecate's ban thrice blasted, thrice infected

The word "ban" in the meaning "curse" makes a possible sense; but the reading of the First Quarto "bane," *i.e.*, poison, is very much better. Dr. Greg suggests that the bad Quarto here has preserved what was actually said on the stage, and that the other two authorities reproduce the spelling used by Shakespeare himself who "had a trick of leaving out a final *e*." So that even the bad Quartos cannot be altogether neglected.

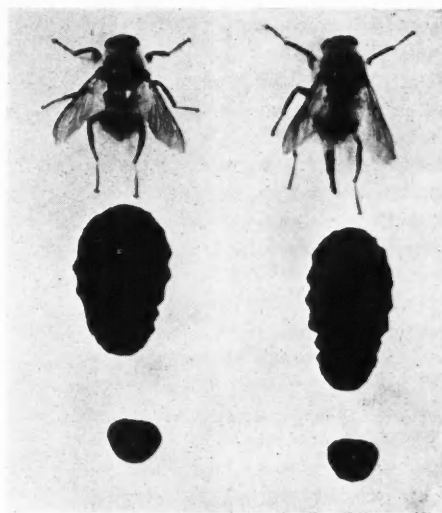
Thanks to the discussion of such concrete examples Dr. Greg's part of the book is not merely the most valuable but, to any lover of Shakespeare, the most interesting. For the generalities without illustration with which the lectures of Professor Alfred Pollard and Sir Edmund Chambers are mainly concerned, make terribly dry reading.

What has been said will show the importance of the volume to Shakespearean study, and it is perhaps wrong to find fault with it for what it does not profess to be. It has the fundamental weakness of such a collection, that it is not a book. The President of the British Academy contributes a graceful preface; but there has been no kind of editing; there are no cross-references; the lectures are arranged merely in the order of the dates at which they were delivered, and there is no index. If even that could have been provided, it is not too much to say that the value of the volume would have been multiplied many times.

Fighting the Warble Pest.

DAMAGE amounting to thousands of pounds is annually caused by the warble fly which attacks the hides of cattle, thus causing serious loss both to the butcher and to the tanner. For some years the Hide and Allied Trades' Improvement Society has conducted a vigorous campaign in an effort to persuade the farmers to take proper precautions against the pest. There is still, however, a great deal of ignorance both regarding the identification of the fly and its treatment.

In *The Leather Trades' Review*, Mr. J. Lowden, secretary of the Association, describes an interesting



Warble flies, showing the pupae cases and (below) the tops of the cases forced off as the flies emerge.

exhibit which he has been showing this summer at the agricultural shows. A museum case contains specimens of the pest in various stages of development, including the eggs of the fly attached to a hair from a cow's leg, grubs taken from the back of a cow, the matured fly accompanied by the pupa case from which it emerged, and specimens of warbled hide containing from 50 to 440 punctures. Some specimens of natural hide, showing the grubs on the inside, gives the farmers some idea of the irritation endured by the animals. The use of derris-soap wash is recommended as the best treatment for the pest, and this is being increasingly applied with very satisfactory results. Before the value of this treatment had been demonstrated to the farmers, much time and trouble had been wasted in elaborate but unsuccessful measures, such as rubbing grease into the cattle.

Hunting the Aurora Borealis.

By A. C. Kreilsheimer.

A party of German meteorologists who took part in the International Polar Year visited Tromsø to study the Aurora Borealis, and its relation to radio phenomena. The leader here describes the work of the expedition.

THE Norwegian scientist, Störmer, was the first to reveal the course of the electron discharge from the sun, after patient and painstaking calculations over a long period. The electrons are the smallest particles charged with electricity, and linked with sunspot phenomena, their bombardment of the earth is possible only to be encountered in the Polar Zones because the magnetic field of our planet attracts the courses of the electrons towards the poles. In any case, the beautiful heavenly display known as the Aurora Borealis is only found regularly in the Polar regions.

After the discovery made by the mathematician Heaviside, that there existed an electricity - conducting ionized layer, at the height of from sixty to 600 miles above the earth's surface, Kennelly, an American, observed that there was another layer at a height greater than that, which has now become known as the

Heaviside layer. Some years later Professor Appleton of King's College, London, observed that there was yet another layer beyond the Kennelly layer, and subsequent experiments by Appleton and the Radio Research Board of this country have led to the belief that there are two further layers. These layers offer an explanation why wireless waves do not radiate aimlessly in space, but are reflected back to earth. The layers behave with respect to radio waves in much the same way as a mirror will reflect light waves, except that the different layers will only reflect radio waves of certain lengths, permitting others to pass through, each layer having a definite range of wave lengths.

The properties of these layers are responsible for the sensational successes of wireless amateurs who, in the sphere of short wave broadcasting, have bridged the great oceans with a transmitting power of a few

watts, at a time when the technical world exerted itself in the direction of increased power for long wave stations to hundreds of kilowatts. It is unfortunate that the layers are not stable, but change radically according to meteorological conditions, and by day and night. To this factor must be blamed the periodical loud and soft reception, or "fading," and it also accounted for the peculiar experience of the Graf Zeppelin, during the period that it was flying within the sphere of the maximal Northern Lights frequency, when no radio connexion was possible.

Measurements, carried out with the object of establishing the height of the Northern Lights, gave the same figures

as the height of the Heaviside layers. This agreement is certainly not pure accident, and to obtain further information was one of the objects of the scientists taking part in the International Polar Year, which was concluded at the end of August. Among the visitors to the "station" at Tromsø was a German party (led by the writer), which was financed by the Heinrich Hertz Society for the Advancement of Radio, and researches were made in conjunction with the Norwegian and British investigators. Tromsø lies at latitude 72° N.

The equipment of our expedition required a great deal of time and study. Apart from ordinary needs,



(Photo: Dipl-Ing Bauer)

The Northern Lights appear in the form of a curtain moving over the sky.

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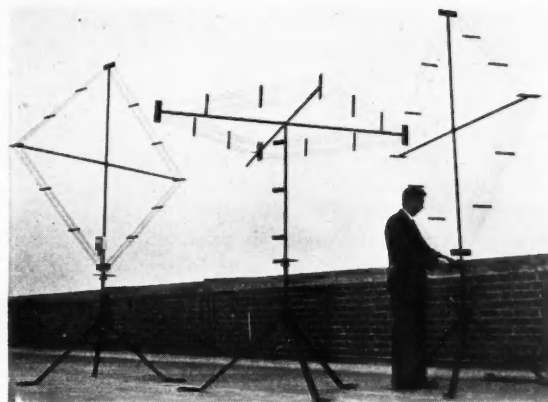
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special radio apparatus had to be devised and manufactured. For the study of the connexion between the Northern Lights and radio phenomena, and the possible influence of the Heaviside layers in causing disturbance of wireless reception, apparatus for measuring the strength of the Aurora Borealis was essential. The brightness of the Northern Lights is measured with photo-electric cells. The actinic value of the light is generally weak and can only be observed during dark hours, so researches work had to be carried out during the Arctic night which endures for three months at Tromsø. The light is not received direct on to the small cell, but is condensed in a huge concave mirror and reflected. Considerable amplification is necessary, so that every variation in light value may be automatically recorded on a revolving paper graph, by the use of the milliampere meter.

It must not be supposed that the Heaviside layers are fixed and bounded spheres. It appears, rather, as if we must refer to electron clouds, which may reform very rapidly with up and down waves, so that the depth of the belt is altered. This will explain how rays sent out from a station are diverted and received from quite a different direction than that which the geographic position of the receiving station would lead one to expect. Apparatus for the study of these conditions was specially constructed for our expedition. With two frame aerials at an angle of 90° to each other, and a novel instrument embodying two coils also at this angle, we were able to register and check up atmospheric experiments in this direction.

There remains the work of measuring the height of the Heaviside layers and the automatic recording of every variation. The principle we worked on is that of the well known acoustic echo plummet which is



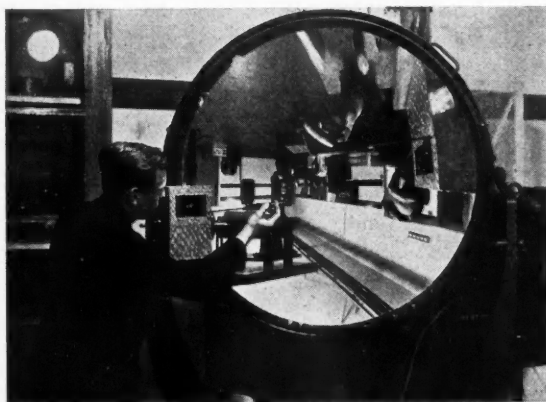
Specially designed aerials erected at Tromsø for the study of radio phenomena.

employed in measuring ocean depths. With this plummet, which is played out until it touches bottom, an electric impulse is sent out, while a microphone picks up the direct impulse and also the echo sent back from the ocean bed. Knowing how long it takes sound to cover a definite distance in the water, and the speed at which the reflected echo travels, it is possible to compare the time between the sending of the direct impulse and the reception of the echo. The method for measuring the Heaviside layers is very similar. A short impulse of one ten-thousandth of a second in length is sent almost vertically upwards, and is reflected back from the Heaviside layers. Both the direct signal and the echo are registered on a graph and the disparity is used, with other measurements, to determine the height.

The transmitter used for these measuring experiments was erected by one of the English investigators at Simavik, fourteen miles from Tromsø. Later the records obtained will be compared with results of the study of sunspot activity and the degree of ionization of the upper atmosphere, and with measurements made by other expeditions.

Some further information on the International Polar Year is given in the latest annual Report of the Meteorological Office, which was issued last month. The British party at Tromsø was organized by Professor E. V. Appleton, assisted by Messrs. R. Naismith and W. C. Brown from the Radio Research Station, Slough, and Mr. C. Builder, of King's College. The completion of their work was largely made possible by a grant of £250 from the Institute of Electrical Engineers.

The full report of the Polar Year will be awaited with much interest, as it represents the most ambitious international research carried out since the War.



Large concave mirror used to condense and reflect the rays from the Aurora Borealis.

A Journey in the Sahara.

By William Donkin.

The author of this article describing a journey in the Sahara was awarded a consolation prize in our travel essay competition. Mr. Donkin writes with misgiving of the spread of European influences in parts of the desert which are tending to destroy the distinctive characteristics of the Nomad inhabitants.

IN these days of positive thought, religion is losing some of its pristine power, but even to-day, although the vastness of the Sahara may be politically under the influence of a European nation, emotionally it is still within the vast empire of a Khalifate whose laws and practices are based upon Koranic instructions. A traveller in the desert is one who is essentially without reasoning power and who yet is of a thoughtful nature. It may seem odd to make a statement which offers a paradox upon the most superficial examination for, one may ask, how can thought be considered logical if it has not reason for its basis? In the desert, however, this apparent paradox is permissible.

The desert offers little food, little water, little luxury, little comfort; the winter brings extreme cold while the summer torments the traveller with heat. In short a journey in the desert is the very antithesis of all that we are accustomed to think of as pleasure. A journey in arid latitudes may be thought an uninteresting discomfort which is better avoided, since there are still many continents of a more fertile and inviting nature which await the traveller. The desert, too, offers no tangible reward to its pilgrims. Emotionally we observe a contrast. We automatically adopt the mode of thought which is peculiar to the inhabitants and we become romanticists. In the monotony of the dunes we decipher symphony of design, in the flatness of the "Tanezruft" we perceive a forcible symbol of apparent absolute flatness, in the rudeness of arid mountains we are charmed both with aesthetic pleasure and romantic suggestion. Sandstorms, discomforting as they are to the body, thrill us with their manifestation of power. The heat of the sun, though it parches us, reminds us of the glory of

our ancient mother, from whose revolving splendour the embryonic earth was once hurled. Our thoughts become as unlimited as the desert itself. There is no curb to our speculations, for convention and solidity have disappeared from our minds.

Such then is the attraction of travelling in the desert. Compensation is often apparent in nature, and one can only assume that this vividness of thought is in a manner a substitute for the absence of corporeal delights. It is because travel in the desert is so lacking in positive action, that it is very difficult to give an interesting description of it. Monotony is its salient feature. Difficulties there are, but they are repeated so often, and endure with such obstinacy, that the description of them conveys a vivid feeling of discomfort to the reader. I will take an instance of this. Last summer a friend and I traversed the Sahara desert from north to south on camel back. The journey took four months. Since we set out in

May and moved through the hottest months of the year, we naturally encountered great difficulties with our camels. Not once did we sell, buy and hire camels but nine or ten times. To describe the difficulties of one occasion is interesting, but the repetition of similar negotiations transacted upon so many occasions is burdensome. We struggled against conditions which were often adverse in the extreme, for not upon one sole occasion did the camels nearly die from thirst, or go mad and sick from unknown causes, but upon a score of days. If such a thing happened but once, it would provide a climax, but when there is always a climax, relativity levels out the effect and we become callous. There were sandstorms time out of number; we lost our way again



Sketch map of the author's route.

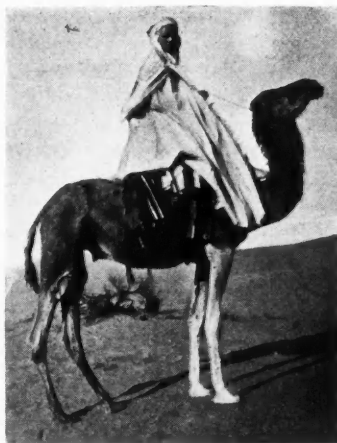
and again; we ate dirty food and drank dirty water; but all these trials were so frequent that they became the normal hardships of a day's work.

It is this mode of life, however, which persuades the Nomads of the desert that their portion is not unblessed. By habit and by power of will they are able to forego the pleasures of civilization. Time, money, commerce, science are alike despised as pedantic usages of perverted humanity. They move over the face of their great desert, accompanied only by their camels; the sun shines upon them by day and the sky is their roof by night.

Dates and a modicum of cereal food are all the nourishment they require, while if they desire some foretaste of Elysian delights such as are described for them in the suras of the Koran, they purchase a few ounces of tea and a cone of sugar.

They remain for a month or two in some valley where the pasturage is sufficient for their camels and goats, and when this has been devoured by locusts or when they tire of the locality, they loosen the pegs of their black tents, load their beasts, gather together their numerous families, and seek some other valley where they again make a temporary home. Unable for the most part to read or write, they babble their supplications to the All High with added fervour, they play games with markings in the sand, they make ropes and clothes from the wool of their camels and water vessels from the skins of their goats, and are indeed as independent as is humanly possible. As such they are a remarkable instance of mentally cultured men, who have been able to withstand by force of environment the redundant prodigies of the Mammon of our Western world.

These men possess a further gift which is noticeable to any who have had personal contact with them. They have a remarkable power of finding their way across the desert, even when, as frequently happens, there is not a track nor a hill to direct them. Their task is made more difficult when



The author on camel-back.

they are forced to direct their course sometimes on this side and sometimes on that in order to find pasturage for the camels. They are thus prohibited from plotting a direct line towards their destination, and each deviation has to be remembered and appreciated with meticulous accuracy. A well ahead will often appear only as a hole in the ground which one may pass quite unnoticed fifty yards away, so that a miscalculation in the choice of route will lead to disaster. We were impressed by this singular power when travelling over vast plains on featureless "Tanezruft" in the stretches to the south of the

Ahaggar mountains, which lie in the centre of the Sahara. Our guide was a Tuareg, one of a race which has for centuries been master of the central desert. These men differ racially, philologically and ethnologically from the Arab Nomads of the north, and much valuable work was done among them by Charles de Foucauld, whose treatises on their customs and language form the basis of our still scanty knowledge of them.

It seemed to me that our guide's remarkable sense of direction was largely subconscious. Before starting out he would concentrate mentally on the direction to be taken, so that when he veered from side to side in search of pasturage for the camels his subconscious mind was always ready to prompt a corrective swerve as soon as opportunity allowed. Of maps he knew nothing, nor were there hills to guide him. This nomadic ability to find the way across featureless and barren desert offers interesting points for reflection, and since that time I have found that it is possible, by concentrating the mind upon the destination, to steer across bewildering country with considerable accuracy. The French colonizers now organize a service of 'buses which traverse the Sahara in a few days, while on the northern borders of the desert influences are being slowly introduced which imperil this nomadic independence. Thus the introduction of European influences may prove a mixed blessing.



A halt in the desert while the camels go to pasturage.

The Land Utilization Survey.

By Basil D. Nicholson.

Mr. Nicholson describes the first maps to be published under the Land Utilization Survey scheme as a spirited attempt to free modern cartography from the archaic technique with which lack of enterprise has succeeded in binding it. The next step, he says, is a "human map of England"—a complete social and economic survey in pictorial form.

IT is not only in the past that the significant events are to be found lodged like jewels among a negligible clutter of kings and battles. The quiet publication of two maps* at the opening of the present year may well come to be regarded, if future historians prove even slightly less incapable than those of the past, as one of the first symptoms of a new world order. But they received a rather sketchy welcome in the Press, and their marketing was characterized by that lack of vigour which is sometimes the British accompaniment of a really good deed.

Intelligent Planning.

These maps are none the less interesting because of the fundamental nature and great extent of their defects. They are claimed to be "the most complete topographical sheets ever published." Seeing that they are planned for a sectional purpose and compiled by schoolboys with over-simplified terms of reference, that is rather a damaging admission for the Ordnance Survey to have to make. Moreover, the results of this research have been super-imposed in a series of colours that could have been more systematically chosen on a map of Ordnance Survey standards of obsolescence. But it is undoubtedly true, however discreditable, that these are the most vividly informative and the most intelligently planned maps so far available of the English countryside. By comparison with them the new Fourth Revision sheets of the ordinary One-Inch Ordnance Map now appearing seem muddled and obscure.

The outline of the Land Utilization Survey project is this. By special colourations the precise nature of every area is indicated—woodland, grass, arable, moor, gardens and "land agriculturally unproductive." This simple formula carried out in six colours—two greens, a brown, yellow, purple and orange—brings the ordinary one-inch map to life. It brings out in bold contrast such essential differences as that between tree-spattered heathland and solid forest, which the ordinary map slurs over. But what is much more important, it provides information that was never before available on any terms. It divides up all

land by reference to its use rather than into three or four crude classes by appearance alone. Permanent grass, rotation grass, rough pasture and so on are here differentiated for the first time. The English countryside is presented to us at last with some of the more essential facts about it actually included. The work of Dr. Dudley Stamp and his local helpers in gathering this information and assimilating it for publication is no less worthy of praise because the Ordnance Survey should have forestalled him at the turn of the century. Here at last is a spirited attempt to free modern cartography from the pedantic and archaic technique with which convention and lack of enterprise have succeeded in binding it.

"Pedantic" and "archaic" are moderate and well-considered strictures in this connexion. There is no shadow of excuse for the modern map's pre-occupation with a scale of geographical values really applicable only to virgin, undeveloped country. The crude facts of physical geography and the elementary qualitative differences in the characteristics of each landscape are no longer of paramount importance, partly because other factors—economic, sociological, climatic—have since become more significant or better understood, and partly because the immense advance in colour-printing and pictorial statistics has given the cartographer of to-day an unprecedented opportunity of indicating the complete characteristics of a countryside—not just a mere selection of them—without overloading his map with detail. It is interesting, in this connexion, to observe that the Land Utilization sheets are clearer and less complex in appearance than the new Fourth Revision Ordnance Survey maps, with their heavy overlay of dyspeptic browns, in spite of the immensely wider range of the information they provide.

The Need for a New Map.

To the student of cartography, though apparently not to the cartographers themselves, it has long been apparent that the old primarily topographical map has had its day. The actual configuration of the land, in England at any rate, has for two centuries been less important than the use made of the various portions of its surface. In virgin or comparatively undeveloped territories there is so little difference

*Land Utilization Survey of Great Britain, 1931-2. Maps on scale of one inch to the mile, sheets 114 (Windsor) and 142 (Isle of Wight). (Ordnance Survey, 4s. each.)

in the value of the various kinds of land, so few complications connected with the degree and nature of its accomplished exploitation, that area—mere bulk of surface—is all that really matters, just as in a previous cartographical age the configuration of the coastline of continents was all that the practical traveller urgently wanted to know. But there are now a hundred facts about the surface of land more important than its area. The nature of the industry super-imposed upon it, the extent of its development, the density of the population grouped there, the economic status of the area as a whole, the public services available, the dominant sex and age-group within it, the number of retail outlets per head and the approximate retail turnover City-Ward by City-Ward or acre by acre—all these facts, many of them not yet available even in undigested statistical form, indicate the nature of the significant contemporary information which the map must aim at supplying if it is to regain its position as one of the key-points in social and distributive organization.

On this view the Land Utilization Survey is obviously an interesting development rather than a real attempt to meet this contemporary need. It calmly exploits the new technical resources of colour-printing and manages, without intending it, to be the best one-inch map publicly available. But its purpose is frankly limited to the graphic presentation of the position of a single dwindling British industry—that of agriculture—and the resultant bias of the maps is well illustrated by the lumping together of all developed and residential areas as "land agriculturally unproductive." Obviously the general contemporary map could not take up such a position. It is more likely under present conditions that it would indicate all agricultural areas as "land of little or no economic value."

It is not fair, of course, to tax with partiality a map compiled with frankly partisan intentions. But it is worth exposing the biased character of the information this map provides because, by dealing

so competently with an industry that occupies, in positive or negative form, the greater part of the face of England, these maps have managed to deserve a more general circulation than the apparent limitation of their scope would suggest was possible.

If a map of England were to be constructed (as, among many others, it could and should be) showing the storage and refining centres of petrol, its distribution points marked according to the volume each one of them handled, and with each administrative area coloured in gradation according to the total turnover of petrol within its borders, nobody would think of using it for general purposes. The industry with which it dealt, though of great and increasing importance, would not be one whose detailed pictorial analysis had any direct topographical bearing comparable with that of agriculture. But such a map would be no more distorted by the limitations of its scope than that which the Land Utilization Survey has produced.

It is largely, however, on the strength of its general value that these Land Utilization

Survey sheets are important. The Ordnance Survey has already tentatively produced a Population Map (Hampshire) coloured on a prismatic scale which suggests many new possibilities in the sequence treatment of symbolic tints. Here was a map giving information about some of the characteristics of an area very possibly as important as the extent and boundaries of its hills and marshes. But this information was presented by itself rather than in conjunction with the landscape to which it applied and the sheet was, therefore, merely a "special purpose" map of the old school—as far off the main line of cartographical advance as Neurath's intensely interesting experiments with pictorial statistics in Vienna. The Land Utilization Survey, though inspired by sectional considerations of a definite kind, does relate its information closely to some of the other known facts about the landscape, and illustrates them all in a single vivid composite picture.



The working plan used during the field work. The letters indicate the tints to be used in the finished map.

It is ungrateful, but necessary, to question on some points the internal efficiency of the Survey. While getting a job of this size done almost entirely on a voluntary basis represents a very creditable piece of organization, such methods inevitably introduce a slightly makeshift element. There is the usual quota of late and incomplete returns, and some of the detail actually published appears debatable. In the Broadmoor neighbourhood, for example, there is a definite conflict of evidence between the Fourth Revision Ordnance Survey and the Land Utilization Sheet (Windsor) which overlaps it, as to the disposition of forest and moorland. Even the best friends of Eel Pie Island in the Thames would hesitate to describe it, as the Survey does, as "gardens, allotments, orchards and nurseries" even if the loudspeaker horn has been temporarily removed from the hotel front! The same objection applies to a wilderness of suburbs in the Acton-Ealing area. Certainly some less obtuse differentiation is required between the different near-urban classifications.

There is also a general doubt about the methods by which an up-to-date survey could possibly be superimposed on a pre-war map without minor but unsatisfactory inaccuracies. Some more vivid sequence, too, could have been arranged among the colours themselves. The eye is given no series to lead it, say, to the most agriculturally important areas by gradations up from waste land on the one hand to industrially developed land on the other. It is presented with an undigested collection of unrelated colours which need to be sorted out one by one and identified separately. Here a definite technical opportunity is clearly missed.

But one feels, in looking at these two sheets, as Tytlyl felt when he turned the jewel in his cap and saw common things with a new, strange, yet real brightness as if a film had been rolled back from across them. These maps, with all their faults in execution and all the partisanship of their intended scope, supply a comparable revelation of one aspect of the areas with which they deal.

A "Map for Civilization."

But one looks to the organizers of this notable effort for something more valuable and courageous still. A human map of England—a "map for civilization," still based on the character and extent of the countryside but covering also the nature and degree of its development, the facilities of human life, the wealth and activities of each community, its social and economic background—is the next essential. Special purpose maps are important, especially when

they embody the qualities of these Land Utilization Survey sheets, but they must be subordinated to the general picture. And this social and economic survey in pictorial form which the Land Utilization Survey foreshadows must not be thought of as a desirable supplement to the ordinary one-inch sheets, but as a series which definitely and finally supersedes them. The map may then recover the position it has deservedly lost as a basis for all action.

The illustration on page 311 shows a section of an Ordnance Survey map used in the preparation of a Land Utilization sheet. Various crops are indicated on this by the surveyors.

The Discovery of Horace's Villa.

EXCAVATIONS at Licenza, a town in the Sabine Hills, have now been definitely identified as the remains of Horace's villa. The house was presented to the poet by Mæcenas, and its discovery has frequently been claimed in the past. Archæologists are now persuaded, however, that the present remains are those of the villa to which references so frequently occur in the works of Horace, since the descriptions there are borne out by the nature of the remains and more particularly by the surroundings. Little of the walls remain, but sufficient is left to show that the house contained twelve rooms grouped round two courtyards.

In a large quadrangle was a swimming pool set in a garden, and in addition to the pool the house contained numerous bathrooms; one was set at a lower level than the rest and was entirely filled with water, which entered through an opening still visible in the wall. An arrangement of steps enabled the bather to choose various depths of water. This room was used exclusively for cold baths. Hot baths were evidently taken in another room under which a furnace was constructed; in another part of the house was a smaller hot bath built in a similar manner. Another remarkable feature of the house was the planning of communicating corridors and the care taken to ensure perfect ventilation.

After the death of Horace, in 8 B.C., the villa is said to have come into the possession of a farmer who used the elaborate bathing arrangements as tanks for the breeding of fish. By the eighth century, however, the house had been converted by monks into a monastery.

The most famous of the remains formerly claimed as those of Horace's villa were near Tivoli, in the grounds of a residence occupied by Mrs. George Hallam, the widow of an English scholar.

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The British Association at Leicester.

By Our Special Correspondent.

The annual meeting of the British Association was notable this year for the number of addresses having a wide public appeal. Outstanding papers are here briefly reviewed for the benefit of readers unable to attend the meeting.

IN attempting to summarize even a selection of the addresses delivered to the British Association the problem is not which to include but which to omit. The Association contains thirteen main sections to each of which several papers are delivered daily throughout the week of the meeting. Some are of a highly specialized character but many in each section are of wide general interest, such for instance as Sir Arthur Eddington on "The Expanding Universe," Lord Raglan on "What Is Tradition?" or Professor Huxley on "Ants and Men." The President, Sir Frederick Gowland Hopkins, set an example to later speakers by his lucid discourse on the chemical aspects of life, and particularly by the latter part of his address which dealt in a more general way with the importance of biology to social progress. The public lectures, and Sir Josiah Stamp's able and witty evening discourse, made a special appeal to members of every section.

Study of Living Systems.

The Presidential address has already been fully reported in the Press. Sir Frederick reviewed the remarkable progress made during recent years in our knowledge of biochemistry and stressed the importance of molecular structure in determining the properties of living systems. He showed how molecules display in living systems the properties inherent in their structure even as they do in the laboratory of the organic chemist. The extent to which chemical substances control and co-ordinate events in the body by virtue of their molecular structure is, of course, closely linked with the functions of hormones and of vitamins. Together they form a large group of substances each of which exerts an indispensable influence upon physiological events. Hormones are produced in the body itself while vitamins must be supplied in diet.

Commenting on the public ignorance of biology the President said that, while few would doubt that popular interest in science was extending, it was mainly confined to the more romantic aspects of modern astronomy and physics. "That biological advances have made less impression," he said, "is probably due to more than one circumstance, of which the chief, doubtless, is the neglect of biology in our educational system. The startling data of modern astronomy and physics,

though of course only when presented in their most superficial aspects, find an easier approach to the uninformed mind than those of the new experimental biology can hope for. The primary concepts involved are paradoxically less familiar. Modern physical science, moreover, has been interpreted to the intelligent public by writers so brilliant that their books have had a great and stimulating influence. Lord Russell once ventured on the statement that in passing from physics to biology one is conscious of a transition from the cosmic to the parochial, because from a cosmic point of view life is a very unimportant affair. Those who know that supposed parish well are convinced that it is rather a metropolis entitled to much more attention than it sometimes obtains from authors of guide-books to the universe. It may be small in extent, but is the seat of all the most significant events. In too many current publications, purporting to summarize scientific progress, biology is left out or receives but scant reference."

The President made an interesting point at the conclusion of his address. He suggested that, though statesmen might possess wisdom adequate for the immediate problems with which they had to deal, there should also be a reservoir of clarified knowledge upon which they might draw. Sir Frederick had recently read afresh Bacon's *New Atlantis*, in which the philosopher had visualized an organization of the best intellects bent on gathering knowledge for practical use in the future. He thought that such an organization might have a very real value to-day, when civilization was in danger and society in transition. He did not picture it as a house composed of scientific authorities alone; it would be an "intellectual exchange" where thought would go ahead of immediate problems. The President's proposal should meet with strong approval from many quarters.

Science and Economics.

The title "Must Science Ruin Economic Progress?" suggested a grim and relentless onslaught. But although Sir Josiah Stamp sifted the subject with characteristic thoroughness, many points in his attack were disposed of with genial levity. It was being commonly stated, he said, that scientific changes were coming so thick and fast that other factors in social life—the intangibles of credit, the improvements in

political and international ideas—were unequal to the task of accommodating them; or else they presented new problems which had no counterpart. Sir Josiah suggested that, if changes in social forms and human behaviour could not be made rapidly enough for the task, science might in that sense ruin economic progress: the world might be better served in the end if scientific innovation were retarded to the maximum rate of social and economic change. Sir Josiah declared that economic life must pay a heavy price in this generation for the ultimate gains of science unless every class of society became more economically and socially minded. He did not, however, support government by scientific technique, for human wills could never be regulated by the principles of mathematics, chemistry or even biology.

Ants and Men.

The similarity between ants and men is often stressed, and it was interesting to hear from Professor Julian Huxley that we can really draw no comparison, although there are some remarkable resemblances. While man owes his position to the development of reason, the ants owe theirs entirely to rigid instinct, and there can be no bridge between the two. Interesting points of resemblance, however, are the fact that ants are the only creatures except man to live an economic life; that they keep domestic pets and cultivate plants; and that they fall a prey to vices—they will, in fact, sacrifice their own offspring rather than forego the pleasures afforded by the sweet secretions obtained from certain parasites. Professor Huxley described the remarkable division of labour among ants, which is based on a caste system, and mentioned the various kinds of which a community is composed—the kings and queens, the soldiers and workers, those that store grain and the living "honey-pots." There was no danger, he said, of the ants evolving so as to take the place of men, since their evolution virtually stopped tens of millions of years ago. Professor Huxley brought out in an interesting way the fundamental questions of human and animal evolution, and the lantern slides gave a vivid impression of the behaviour of ants and termites.

The outstanding features in Section A (Mathematics and Physics) were Lord Rutherford's review of twenty-five years' work on atomic transmutation and Sir Arthur Eddington's address on the expanding universe. After reviewing early developments, Lord Rutherford mentioned the remarkable properties of the neutron which was proving highly effective in producing transformations of a novel type in several elements; oxygen, for instance, could be transformed

into carbon and helium, and nitrogen into boron and helium. He explained that fast particles of a different kind were now being required for bombardment, and these were being obtained by the use of electrical discharge in a gas, as much as 5,000,000 volts being necessary to effect acceleration. Meanwhile, Cockroft and Walton at Cambridge were breaking up elements such as lithium, boron and fluorine by means of artificially produced projectiles, and much smaller voltages were being employed. Turning to prospects twenty or thirty years ahead, Lord Rutherford said that voltages of millions of volts would probably be unnecessary as a means of accelerating bombarding particles. Ultimately he believed that we should be able to transform all the elements. Anyone, however, who looked for a source of power in the transformation of the atoms was "talking moonshine." The subject was of scientific importance only because it gave insight into the atoms. Lord Rutherford was followed by Dr. E. T. S. Walton, who described recent research carried out by himself and Dr. J. D. Cockroft.

Sir Arthur Eddington dealt with the fact, indicated by astronomical observations, that the galaxies (spiral nebulae) are scattering apart at a rapid rate. Their distances from us and from one another become doubled in about 1,300 million years. Sir Arthur pointed out, however, that evidence gained by observation is scarcely strong enough to warrant far-reaching conclusions unless there is independent confirmation. This, he said, is supplied to a certain extent by the theory of relativity, which requires that the universe is either expanding or contracting. It does not, however, predict the rate. This depends on a constant denoted by the Greek letter lambda whose value cannot be discovered by the relativity theory alone. Sir Arthur pointed out that the statements made by some authorities that lambda can have zero value conflict with the principle of relativity. That the theoretical rate of expansion, however, is of the same order of magnitude as that found from observation of the spiral nebulae can be roughly proved. Sir Arthur then gave a formula for the rate of expansion of the universe: the value of the recession of the spiral nebulae appeared to be 780 kilometres per second per parsec.

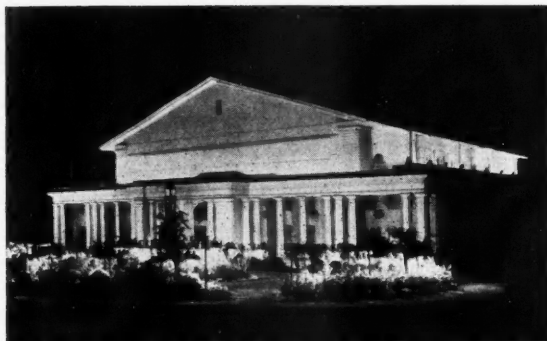
Forecasting the Weather.

Long-range weather forecasting is perhaps of greater economic importance in the tropics than in this country, but its scientific problems have a far wider appeal. As a former Director-General of Indian Observatories, Sir Gilbert Walker's presidential address to Section A, on "Seasonal Weather and Its Prediction," was of value.



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The floodlit De Montfort Hall at Leicester where the President's inaugural address was delivered.

Dealing with unusual weather, the President pointed to the fact that its causes seem hopelessly obscure to the layman; hence primitive ideas, surviving from countless ages of magical practices, still come to the surface in connexion with it. In India he had been officially asked the need of an expensive and difficult scientific inquiry into the causes of drought when Hindu astrology could indicate what was coming; and many countries that claimed to be dominated by Western science failed to recognize that events in weather obeyed the ordinary laws of physics and chemistry. In agricultural countries in which a failure of the rains involved a national calamity, the desirability of making preparations in advance had long ago led to efforts at prediction; and the demand had been so great that the supply had been forthcoming before its quality would bear the most cursory examination. Sir Gilbert sketched in an interesting way the relationships which have been found between seasonal features in different parts of the world, and described the efforts made to issue long-range forecasts. Finally, he considered the directions in which improvements in technique might be hoped for.

During the past twenty-seven years Mr. M. B. Cotsworth has gathered impressive information from Alaska, British Columbia, Greenland, Siberia and other countries, which indicates that there is a continuous but gradual change of climatic conditions, developed by the gravitational force of the stupendous glacial ice-cap accumulating in Greenland and Baffin's Land. In an address to Section C (Geology) he pointed out that this accumulation appears to exert a doubled effect, as it seems to gather weight from the rapidly receding Alaskan ice-cap and glaciers which (while being reduced by the incessant evaporation of the warm Pacific air currents, impelled eastwards to deposit snow accumulations in Greenland) lightens

the pressure on the earth's crust in Alaska while increasing the depression of the crust and weight in Greenland. Mr. Cotsworth showed large scale photographs of the glacial recessions in Alaska, taken and confirmed by both the British and the American Government surveyors. He proposed that, since glaciation occurred in South Africa before the Carboniferous Period, and that the aridity of North Africa and Western Asia have continuously increased during recorded history, a committee should be appointed to consider such researches, which needed a wider range of investigations than any individual geologist could cover.

In the same section, another address which has escaped notice in the Press was that delivered by Professor G. Hickling on recent studies of plant structure in coal. Improvements in the technique of section-cutting and photography have made it possible to show that coal consists largely of plant-remains in which the details of the original structure are preserved with remarkable perfection. By the study of isolated sheets of bark and portions of wood which are preserved as coal in the coal-measure shales, the microstructure of the plants can be studied in relation to their external form. In certain cases, according to Professor Hickling, it appears possible to demonstrate conclusively that the existing coal consists in part of the original plant-substance and in part of additional organic material which has been absorbed by the plant after death.

Zoological Problems.

"The Mechanical View of Life," was examined in an address by Dr. J. Gray, President of Section D (Zoology). He showed that experimental zoologists are to an increasing extent borrowing the weapons of physical chemistry, and suggested that the time had come to consider the general point of view which underlies this type of attack on zoological problems. What, he asked, is our conception of the essential nature of the living organism? Do we believe that the activity of living matter and its potentiality for change can be expressed adequately in terms of physical units? Do we incline to the belief that living animals have been evolved from inanimate matter? Summarising the position, Dr. Gray said that the only laws which physics has provided for an analysis of biological phenomena rest on a statistical basis; they only describe natural phenomena in terms of probability and not of absolute truth. If we accept these laws as a means of describing the behaviour or the structure of an organism, we must accept the conventions attached to the laws and agree

to ignore such events as are improbable although they may conceivably occur.

From this point of view, the spontaneous origin of living from inanimate matter must be regarded as a highly improbable event, and as such can be assumed not to have occurred. Similarly, the development of an organism from so-called undifferentiated protoplasm involves processes which are entirely without parallel in inanimate nature. So long as this state of our knowledge persists, he claimed that it is dangerous to assume that the statistical laws of physics can satisfactorily describe all biological events. Our knowledge of the physical and biological properties of living matter, he said, suggests that the fundamental unit of structure is extremely small, and that it contains potentialities for change which are unique in the universe: "These properties we must accept as fundamental axioms of our science which may or may not prove (in the future) to have their parallel in the physical world."

An important subject which has not received wide public attention is the distribution of insects by air currents at various levels in the atmosphere. In an address to the Zoology Section Mr. P. S. Milne described how the influence of wind on the distribution of insects is being obtained. Insects carried by air currents are filtered from the atmosphere by the action of the wind upon a conical collecting net supported above the ground by a system of kites. The net is closed and sent up to the desired height. It is allowed to fly open for a predetermined period, and after closing again is hauled down for an examination of the catch. The opening and closing of the net are controlled by a simple chemically-operated release mechanism. By this means valuable knowledge is being obtained, and particular attention is being paid to agricultural pests and their possible introduction into this country from the Continent at high altitudes.

Geography and the Layman.

In an absorbing address on "Geography as Mental Equipment," Lord Meston surveyed some aspects of the subject from the layman's point of view, and enquired how this science could be advanced so as to enter more intimately "into the cultural outfit of future ordinary men and women." Lord Meston drew a vivid picture of the tremendous changes which have taken place in the surface of the earth. He pointed to the fact that it was only a fraction of time since "this green and pleasant land" was buried beneath an ice-cap such as Admiral Byrd saw with something akin to terror when he was flying in the Antarctic. It might be only another fraction of time before all that

we saw around us to-day was crushed into oblivion by another glacial visitation. How many such changes and catastrophes in the past, he asked, would the record of geography unfold when we are able to read it? Meanwhile we could only guess at some of them. We could travel, for example, from ice-bound Britain to the African Sahara, then a moist, warm expanse of open grass-land, abounding in flocks and herds, and peopled by men primitive enough, but with a startling artistic skill in rock drawings. Or, instead of wandering south from the glaciers of Central Europe, we could turn east to the other gigantic ice-fields, which then lay over the uplands of Asia and segregated, in their own home territories, to develop on their own separate lines, the progenitors of some of the chief racial families of mankind to-day. On our way we should pass that ancient central Asian ocean which was now represented by shrunken fragments in Lake Aral and the Caspian Sea.

The "Human Family."

An interesting reflection emerged from Lord Meston's theory: that geography had hardly any interest for us except in relation to the movements of life, and primarily of man, about the globe. Amid the wastes of glaciers and zones of volcanic fire, there seemed to have been stray enclaves of habitable land; it was those oases, he said, which formed the focus of our interest to-day, with the help which they gave in explaining the sharply differential characteristics of the human family.

Losses and gains of land round the coasts of Great Britain about balance, but the land lost is generally good agricultural land, and even parts of towns or villages, and the gain is only sand or shingle. The loss can, of course, be prevented by coast defence works, such as sea embankments or sea walls, the drainage of clay cliffs, and groyning. Although reclamation of land from the sea for industrial purposes may be an economic process it is clearly not so for agricultural purposes unless it is carried out in combination with dredging or the disposal of waste materials. A new scheme for using house refuse to raise the level of low-lying ground was mentioned by Mr. M. Du-Plat-Taylor in an address to Section G (Engineering). He pointed out that, in London alone, the quantity of house refuse to be disposed of annually is one and a half million tons, and in addition, three million tons of sludge from sewage disposal is sent out to be dumped at sea. He suggested that means of disposing of all this upon marsh or mud land should be more fully investigated.

Lord Raglan's witty and provocative address on

"What Is Tradition?" was the outstanding event in Section H (Anthropology). He defined tradition as "anything which is handed down orally from age to age," which therefore consisted of farming methods, methods of craftsmanship, of eating, drinking and preparing food, marriage customs, rites and ceremonies at birth, death and initiation, etiquette, superstitions, games, sports, song and dances, and finally traditional narratives. We might then regard tradition as a code which, entirely in the case of the savage and very largely in the case of civilized peoples, regulated the conduct and activities of mankind throughout life. One of the strongest branches of tradition is that connected with families. This Lord Raglan disposed of with a nice wit.

Pedigrees.

"There are," he said, "in this country many families whose 'traditions' take them back to the time of the Normal Conquest, when their ancestors are alleged to have distinguished themselves either on the side of the Normans or of the Saxons. It can be said without fear of contradiction from those who have studied the subject that not one of these is a genuine tradition. All are the work of 'pedigree fakers,' who have flourished from very early times, and there is not a word of truth in any of them. No English family can trace a genuine descent to the Saxons, and though there are a few families with a genuine Norman descent, this in no cases goes as far back as the eleventh century. Those who believe that a craving for historical accuracy is the ruling passion of the human race would no doubt suppose that all these families were very grateful to historians for correcting their pedigrees, but they would be very much mistaken!"

Lord Raglan concluded an ingenious address by declaring that the only sure foundation for the edifice of science was the concrete of ascertained fact, reinforced by the steel rods of universally tested theory. The ground upon which the edifice of social anthropology had to be built was encumbered not merely by the ruins of ancient superstitions, but also by the jerry-buildings of pseudo-history and pseudopsychology, and many anthropologists had believed that these survivals could be incorporated in the new edifice. The result had been that social anthropology has been allotted, very properly, a low place among the sciences. It would never occupy what should be its proper place until a vast quantity of pre-scientific and pseudo-scientific rubbish had been cleared from its path.

Professor E. D. Adrian made a highly specialized

subject interesting when he addressed Section I (Physiology) on the activity of nerve cells. He explained how the nervous system—the brain, spinal chord and peripheral nerves—is made up of a large number of living cells which grow, maintain themselves by the metabolism of foodstuffs, and carry out all the complex reactions of living protoplasm. He showed how the function of the cells in the nervous system is to make the organism respond rapidly and effectively to changes in its environment. To achieve this they have, of course, developed a specialized structure and a complex arrangement in the body. Professor Adrian went on to explain that the cells of the nervous system send out long threads of protoplasm which serve for the rapid transmission of signals, and they are linked to one another by elaborate breaching connexions in the brain and the spinal chord.

The lecturer dealt with the elaborate transplantation experiments which are nowadays carried out by embryologists on amphibian larvæ. Animals are produced with supernumerary limbs, eyes, noses and even spinal chords. The growing nervous system is faced with these unusual bodily arrangements, and by studying the changes induced in it it is possible to form some idea of the factors which determine its normal structure. This new embryological work shows that the nervous system is made up of "neurones," cells with thread-like extensions, and that they are the only active elements in it. These elements are all cast in the same mould, but are shaped differently by the forces of development. Professor Adrian explained that to this we could now add that all neurones seem to do their work in the same way. The activity which they show is in some respects remarkably simple. It is essentially rhythmic: a series of rapid alternations between the resting and the active state, due probably to rapid breakdown and repair of the surface.

The Nervous System.

This is found from the analysis of minute electric changes, for cell activity sets up electrical eddies in the surrounding fluid, and these can be measured with a minimum of interference. The clearest results are given by the peripheral nerve fibres which connect the central nervous system to the sense organs and the muscles. The nerve fibres are conveniently arranged in bundles to form the nerve trunks: each fibre is an independent conducting path and there may be a thousand such paths in a fair-sized nerve, but it is not a difficult matter to study what takes place in the single fibre when it conducts a message.

Two demonstrations of television were given to members of the Association. The Baird Company transmitted talking films which were shown on a cathode-ray tube, ultimately suitable for the home, while the demonstration given by the Marconi Company was designed to demonstrate the possibilities of television for public entertainment. The Baird picture, which was nine inches square, was a 120-line image, as compared with the thirty-line image at present transmitted by the B.B.C.; much finer detail was thus obtained. At the transmitting end a special type of film projector was employed. There is clearly a future for the transmission of films by television, but judging from the demonstration at Leicester, we think that films should be made specially for this purpose. Films designed for direct projection in the cinema, which involves a totally different technique, contain far too much detail to be suitable at this stage for television.

The Marconi demonstration incorporated a novel feature—the "light beam link." Television images are, of course, normally sent from the transmitter to the receiver either by means of radio

or by land line. The place of these is taken in the Marconi system by the light beam link. This consists of a transmitter in which the electrical impulses corresponding to the television picture signals are converted into the light variations of a specially designed sodium tube which is mounted in a search-light fitting. The beam from this is picked up by a photo-cell at the receiver and the light variations are converted into electrical impulses which actuate suitable mechanism in the television receiver. The picture was five feet square and a fifty-line image was shown.

On the last day of the meeting, Major A. G. Church gave an able review of recent developments in television, and on this occasion a special programme was transmitted to Leicester by the B.B.C.

It has been possible in the space of this brief review to mention only a few of the activities of the British Association, and attention has been restricted to addresses which seemed to have the widest general appeal. Sir William B. Hardy has been elected to succeed Sir Frederick Gowland Hopkins as President for next year.

Germany Tackles Television.

A PHOTOGRAPH on our cover this month illustrates a combined cathode-ray television receiver and radio-gramophone shown for the first time at the Berlin Radio Exhibition. The exhibition marked the first step towards a public television service in Germany. Hitherto the Post Office had held back even an experimental service, so as not to impede technical development, all patents being pooled to accelerate progress. The new German standard picture, consisting of 180 scanning lines, is officially considered sufficient for the opening of regular transmissions. This will mean the erection of ultra-short-wave transmitters in most large towns. It is impossible to effect this rapidly, but regular television broadcasts are expected to be in progress by the winter of 1934-35.

The receiver illustrated was exhibited by Telefunken, who also showed in operation a complete film transmitter. The scene to be televised is photographed by means of a cinema camera, the film then being developed, fixed and televised in the ordinary manner. It is, of course, much simpler to scan a film than to scan directly a badly illuminated scene, and the period between the actual happening and its transmission by television is under ten seconds, a surprising achievement.

Another interesting exhibit was a complete television receiver for use in large halls. This was shown by Fernseh A. G., and the apparatus operates on the film principle described above. In order to make the system more economical a continuous celluloid band is exposed to the incoming television picture, developed, fixed, washed, and partly dried before being passed through a cinema projector. The image is then washed away and the band is ready for use a second time. This seems complicated but in reality the whole apparatus can be easily mounted on a normal motor-car chassis if this should be required. The invention was only completed in May, and it is astonishing that the Fernseh A.G. have been able to produce the complete apparatus within so short a time.

The quality of the picture at present is equal to that of a slightly under-exposed home talking film. The inventor, Dr. Schubert, told us that in about two month's time the slight imperfections still contained in the picture would be completely removed. Readers will appreciate the ingenious construction of this new receiver if they bear in mind that the incoming television impulses can only impress the film for one millionth of a second.

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Contemporary Design—IV.

A Revival in Wood Engraving.

By Robert Gibbings.

Wood engraving is again coming into its own for book illustration, and many contemporary artists are employing it as a medium for original expression. Whether the artist should attempt to interpret the text of a book or merely to ornament the pages is among the interesting points discussed by the author.

OF the making of book illustrations there is no end and much "process" work is a weariness of the flesh, so in the constant ebb and flow of fashion, wood engraving is once more upon the town. What is wood engraving? It has nothing to do with wood carving. It is the art of cutting away portions from the surface of a block of wood so that the remaining shapes when coated with ink will print on paper a design conveying the artist's intention. This cutting away may be accomplished in two ways, either with a knife on the side grain of the wood or with a graver, sometimes called a burin, on the cross section of the tree, that is on the end grain. The result of the former is a woodcut; the result of the latter is a wood engraving.

The woodcut is by far the oldest of the two processes. It goes back in Europe to as early as the year 1400, while in China the art has been known for probably 2,000 years, being used extensively in that country for printing on fabrics. In more recent times Japanese colour prints have achieved a world wide popularity; they are printed from several blocks, one for each colour, but the pigment is water colour and they are quite unsuitable for book illustration. It is amusing to note that towards the end of the fourteenth century in Europe the two chief uses of woodcuts were for religious pictures and for playing cards. Prints, probably made by the monks, depicting events in the life of Christ and the Saints found a great sale among pilgrims. The playing cards were coloured by stencils. Wood cutting continued to flourish up to the time of Durer and Holbein and then on to the end of the eighteenth century, although the latter part of this period was marked by a sad decline in quality. Then came the Englishman, Thomas Bewick, who invented the end grain method which is more particularly

under discussion here. The burin has the great advantage over the knife that it need only once traverse the surface of the wood in order to leave its mark, whereas with a knife it is necessary to make

two strokes in order to cut out the V shaped strip whose vacant space will print as a white line. The graver suggests itself therefore as the most accurate weapon for the work, and whereas there is only one shape to a knife edge there are numerous varieties of burins called by such pleasant names as spitstickers, bullstickers, scorpers, etc. Thus an infinite number of different textures can be obtained with ease, ranging from simple areas of flat white-and-black to the minutest white pin points.



An engraving by the author for "Count Stefan" by A. E. Coppard (Golden Cockerel Press).

It is in order to get over the difficulty of the grain of the wood that a cross section of the tree is used. By working on this instead of on the plank the artist finds nothing to interfere with the rhythm of the graver, which will move with ease in any direction as though it were cutting through hard cheese. The wood most used is box and the best species comes from Turkey, where the rate of growth is more favourable to even texture of grain than that grown in Canada or other countries.

One difficulty, however, is that the box is a small tree, so that when a large block is required it has to be made up of numerous small pieces which are nowadays joined together with mahogany battens. In the "good old days" before the advent of photo process all the magazines were illustrated by wood engravings, and in order that incidents should be chronicled as soon as possible after their event it was customary for the many small portions of each block to be joined together by bolts and nuts fitted into slots cut in the back of the block. As soon as the illustrator had completed his design on the full block the bolts were undone, and each separate section

handed over to a different engraver thereby saving much time. In due course all the component parts were reassembled, and with a little touching up at the joints the block was ready for the printer. This multiple method accounts for the fine white rectangular lines sometimes seen across illustrations of this period which are due to imperfect readjustment of the sections.

During the nineteenth century it was the custom for such men as the two Dalziels and Swain to engrave the drawings of Keene, Burne Jones, Walter Crane, Millais and other well-known illustrators, and it was the boast of these craftsmen that they could engrave anything the artist could draw.

Unfortunately this tremendous technical skill was a harmful thing to its own craft, for the artists had less and less need to consider the limitations of their medium with the result that wood engraving from being a means of artistic expression in the hands of such men as Bewick and Calvert became merely a mechanical method of reproduction, as divorced from all intrinsic art as a half-tone plate is to-day. A somewhat parallel result is now happening with sculptors who are not themselves carvers; they are content to model in clay and leave their stone or marble in the hands of a skilful mason, who has probably to contend with a design entirely unsuited to the medium. Only when there is more direct carving and less intermediate modelling will there be an era of greater monumental art in this country. Before the war a few artists, such as Charles Ricketts and Charles Shannon, Gordon Craig, Noel Rooke and Lucien Pissarro, had rediscovered the medium as a vehicle for personal expression, and when in 1920 the Society of Wood Engravers was formed the art received a tremendous impetus towards its present flourishing condition.

To-day wood engraving has come into its own once more, and many of the best contemporary artists are using it as a method for original expression. A sharp graver can give as beautiful a formal line as any



An engraving by Eric Gill.

medium in the world.

In æsthetic outlook the formality of engraving is akin to that of stone carving or tempera painting. Every line has to be carefully considered before it is cut; there can be no rubbing out; there must be no mistakes; in addition the wood is hard; the graver will not "sketch." It is, in fact, the exact opposite in thought to etching which by

reason of its fluency has more in common with water colours, but it is because of this very discipline, of this rigid austerity, that many post-war artists are drawn towards the medium. Before the war we were all romantic; now we are very stern realists. We were formerly taught "not to give ourselves away" by too definite statements: now we are more honest; we want the truth both in our work and about ourselves. Other mediums will cover defects in drawing; a little overinking or false biting on a copper plate will work wonders; a little vagueness in a water-colour can hide a multitude of sins. In engraving every stroke must be reasoned and calculated, and it is either right or wrong; there can be no ambiguity.

There are two main schools of thought regarding the actual technique. The purists say that as the incised line prints white, direct expression by the artist should therefore be by white lines cut on the block; and to put these theories into practise they first coat their wood block with Indian ink and then proceed to build up their design in white.

Where the final result is destined for the wall or portfolio there is no reason why the problem should not be tackled by this method, which may certainly be the most conducive to fluent thought. But on the other hand, those of us who have been for any length of time in close touch with fine printing hold that the wood is there to be mastered, and that it is for the craftsman to "mould" the wood to the required shapes so that it may harmonize with the type used for printing. It seems to the writer that when a book is to be illustrated or decorated it is essential that the

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artist should approach it with reasonable humility, and not expect new types to be designed and cast to suit each variation of his temperament; rather, accepting the "texture" offered him, he should by his mastery be able to produce a perfect harmony between wood and metal. This æsthetic harmony is equally important in the mechanics of printing, for in order to print a page evenly there has to be a very sensitive adjustment of the ink supply. And if the block does not bear some relation to the surface texture of the type, either the blocks will print grey or the type will print too black. Many youthful engravers are inclined to underestimate this necessity, but from practical experience of printing over a thousand blocks, I know that the sole use of white line is neither æsthetically nor practically satisfactory

trations or merely decorate the pages with ornament, and it is now generally agreed that a closely literal picture of any scene described by the author is far more apt to dull than clarify the readers perception. Apart from popular publications of a certain type, which may be left out of this discussion, we may assume that any book worthy of embellishment is a good book, but if it is a good book it should not need interpretation. Assuming that it is well written it seems merely redundant to add pictures, but against this argument there is the fact that illustrated books have become a very real tradition in our civilization, and even many people of strictly literary taste prefer them to unadorned pages. The happiest result undoubtedly is where the embellishment grows naturally from the type. Because we admire a text we may wish to



An engraving by Robert Gibbings for Keats' "Hyperion" (Golden Cockerell Press).

when used in close conjunction with type.

It is a much debated point whether the artist should attempt to interpret the text of a book by his illus-

print it on good paper and to use a good type. It would be natural to add an initial letter at the beginning of each chapter, and according to the importance of

the text the decorations would grow until such a superb design is achieved as that by Eric Gill in *The Four Gospels*. Such decoration becomes an integral part of the page and is far removed from the "Academy picture" added as an afterthought.

Title pages naturally lend themselves to decorative treatment and it would be equally natural that borders either vertical or horizontal should illuminate the pages, but after the initial opening perhaps the most suitable place for ornament is at the end of a chapter. As most printers are aware, chapters have a habit of ending with very few lines on the top of a page; here then is a suitable place for adornment.

Most publishers, when dealing with their artists, simply state the size of the page and how many illustrations they require, and the artist, having made his headings and tail-pieces finds that they do not fit the chapters for which they were intended. So the printer drops them in wherever there is space, very often with incongruous results. If we lived in Utopia all publishers would hand their artist the book with the type set, page by page, showing precisely what space was available for enrichment. Designs could then be made to fit a particular shape, and the finished volume would have a sense of unity impossible to

achieve by the present haphazard methods. Wood engraving of all mediums lends itself to this close unification with the printed page. The actual blocks are made exactly the same height as type and, as previously explained, the design when engraved is embossed on the wood just as the letters of type are embossed on the metal, so the whole "forme" of type and illustrations can be printed at one and the same time. Where engravings on copper are used they have to be printed separately from the text in a totally different kind of press, and the result can never be anything but "a book with so many plates." The same objection holds with most other methods of reproduction, and if such "horrors" as half-tones are employed, it becomes necessary to use a chalk surfaced paper equally unpleasant to the sight and touch.

To achieve the best results in book making it should be arranged that the artist and compositor work in close touch with each other throughout. Each can help the other with suggestions and such co-operation gives much greater flexibility of design, but unfortunately there are still lamentably few printers and publishers who have the vision necessary to realize that a little extra money spent at the outset will be more than repaid by results.

The Bronze Age in Britain.

SEVERAL discoveries during the past month have thrown important new light on the Bronze Age in Britain. The most noteworthy comes from Shetland, where Mr. A. O. Curle has just completed his third season's work on a prehistoric settlement. Here the earliest settlement dated from the Bronze Age; and a circular building was found, to have served a factory for the settlement. In one of five chambers were found over forty rude stone implements of the type peculiar to Shetland, and round a centrally situated hearth were fragments of clay moulds for making bronze swords. As these had not been used, this was evidently a sword factory. In the next phase of occupation, still Bronze Age, but with Early Iron Age influence beginning to appear in the pottery, the metal-making industry evidently continued, for moulds for both swords and axes were found. In the last phase of occupation, iron slag indicated that the transition to the Iron Age had been fully made. The evidence pointing to a relatively high development of culture and no mean standard of comfort for the period in this remote district is remarkable.

Another settlement, but of indeterminate date, has been exposed in the Orkneys on Papa Westray, where two large stone buildings of an entirely new type have been excavated. In some respects they recall the now famous settlement of Skara Brae, excavated by Professor Gordon Childe. The two buildings are connected by a passage and both have doorways leading into a courtyard or street. This, however, has disappeared owing to the encroachment of the sea.

One of the buildings is well preserved, its walls still standing to a height of six feet. The second building has unfortunately collapsed; but it has been possible to make out its plan. Much of the site still has to be examined, so that there should be a chance of learning more of this interesting settlement.

One of the most fruitful fields of research in British prehistory has been Dr. Cyril Fox's investigation into the relation of environment and settlement in Early Britain. Dr. Fox has shown how in south-eastern England, settlement can be traced as a progression from the open light soils first occupied to the heavy clay lands.

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Correspondence.

BASIC ENGLISH.

To the Editor of DISCOVERY.

DEAR SIR,

I have read with interest the article on "Basic English" in the September number of DISCOVERY. It is true that much may be said in very few words. At first sight, therefore, Basic possesses a specious attractiveness. Closer investigation, however, shows that the scheme is by no means confined to the list of 850 words. We find, for example, that numerals, and words of measurement and currency, are to be used in their English form: also terms that are "international." But if all international words are good Basic, the list may swell to many thousands!

Most names of animals, plants, foods, scientific terms, and of bygone or imaginary things (e.g., *lion, duck, rose, pork, crystal, castle, fairy*), have no place in the Basic list. The unhappy student wishing to order roast pigeon may perhaps ask for *bird that Noah sent out to see if there was land, cooked by open fire (in oven)*. The Esperanto *rosita kolombo* seems preferable. To speak of a syringe he may either think out *pipe with nosebit and push-pull apparatus into which liquid is got by using air-power, to be sent out in a thin line, for gardens, medical purposes, and so on*, or perhaps shorten this into *water-forcing apparatus (with bulb)*. If, however, he still finds these circumlocutions unsatisfactory, he has a remedy—he may use the correct English word in italics, or add it in brackets, or else introduce it by a footnote. But how is he to speak in italics, or brackets, or with the aid of a footnote? He will be glad to know that the Basic list will later on be supplemented by officializing 100 general scientific terms, plus fifty specific terms for each science. But he may wonder who will prevent the words in each fifty (and how many fifties will there be?) from straying into ordinary life or into other compartments.

Wishing to order from his *food-list* a dinner of fried sole, minced veal and onions, cabbage, and gooseberry pie, the student may ask for *small flat-fish with delicate taste, cooked with fat over the fire, young beef cut up very small, with white roots that make eyes full of water, green plant food with round heart or head, and green-yellow berries with hairs on skin, covered with paste*. Imagine Basicists visiting a church. They might speak of its *high round or square structure (tower), structure ending in a point (spire), supports (pillars), things in memory of (monuments), high table (altar), stone basin (font), high place for talk (pulpit) and pipes for music (organ)*, but the words for nave, aisles, and chancel are not in the Basic dictionary. If they stayed for the *order of events (service)*, they might join with the *trained company of voices (choir) in songs of religion (hymns)* and be edified by the *talker's (preacher's) explanations of statement of future events (prophecy)*, but would they be satisfied when he spoke of the Cross as the *sign* ×, or asked them to praise God with *words of approval of the Father*?

It is clear that to talk of Basic as a system consisting of 850 words is profoundly misleading. There is a vast reserve vocabulary, very vague, indefinitely extensible, and varying according to circumstances. To claim that the system suffices for almost everything we normally desire to say is equally misleading. Its vocabulary of common terms is less than that of a small child, and insufficient even for the every-day requirements of a country labourer. Moreover, vocabulary is only one part of the problem. The pronunciation of the 850 words may perhaps be learnt by gramophone records, but these will not

teach the other words. And there are hosts of difficulties of syntax and idiom which the restriction of vocabulary does not remove. The student who has learned 850 words, and the innumerable additions to that list, plus the necessary technical Latin and French, is only at the beginning of his troubles. It should be further remembered that Basic is as yet only an untried project. If it should ever reach the stage of practical use—say in an international congress—will the Englishman be able to remember which words and idioms he must forget? If he is told (as he is) that he can be allowed more freedom than the foreigner, what limits are there to this dangerous liberty? Will it make for certainty or equality of use, and for the purity or intelligibility of the language? And will the foreigner in his turn be able or willing to be restricted (especially if he begins to dip into normal English literature)? It is obvious that to both parties the restrictions will soon seem arbitrary and useless, and the temptation to overstep them will be irresistible. Basic will thus inevitably degenerate into innumerable variants, merging in greater or less degree into standard English. And if it be said that in this case all is well, for then the goal will have been reached by the universal use of English, though in numerous varying dialects, let us ask ourselves whether we should be content to see our native tongue so mangled and debased?

Yours faithfully,

British Esperanto Association,
London, W.C.I.

MONTAGUE C. BUTLER.

DEAR SIR,

I am but an occasional reader of your paper and am really unaware whether you tolerate the entrance of linguists—and more especially interlinguists—into your columns. The article on "Basic English" suggests that you do, and it is with that, that I wish to deal.

The international aspect of linguistics has interested me for many years. I agree with Mr. Ogden in tendency but not in conclusions. Psychology *must*, as he makes clear, be taken into consideration. I therefore view with delight the efforts of Continental scientists to create a European language which shall cause the minimum of friction to the maximum of users. This Basic does not do, since it is an attempt to impose an anticultural medium on the cultured European, the only man who really needs an interlanguage. The East has little interest in the pidgin Anglo-saxon of "Ogdenese": it requires rather the scientific Greco-Latin which will open European science to it. This my Continental friends are providing with their Occidental (1922), which has ten years' start of Basic.

Yours faithfully,

Downing College,
Cambridge.

S. W. BEER.

"FILLING A GAP."

To the Editor of DISCOVERY.

DEAR SIR,

I was introduced to DISCOVERY three years ago and have not missed a number since. For those of us who are not specialists but desire to be acquainted with the progress of knowledge in various fields, your journal fills a most useful gap. I notice that during the past year or two its scope has extended even more widely than formerly.

Yours faithfully,

Kingswood,
Surrey.

A. L. WATTS.

Higher Speeds on the Railways.

New Oil and Electric "Railcars."

The call for faster traffic on the railways has been followed by the introduction of high-speed locomotives in this country, on the Continent and in the United States. A "bullet" coach with a racing car engine, a streamlined aluminium train, and Diesel oil and electric "railcars" are among the developments here described.

A NOVEL type of "railbus," driven by a Diesel electric engine, represents one of the latest developments in railway locomotives. It has been built at Newcastle by Armstrong-Whitworth for high-speed service on local lines and is capable of speeds up to seventy miles an hour. A recent trial run from Newcastle to London has also established its suitability for long distance work. The railbus is driven by an electric engine similar to the type already employed for commercial road vehicles and the coach is streamlined in order that the maximum speed may be obtained.

An interesting development in the use of Diesel oil engines for railway trains is the combined steam and oil locomotive which has just been designed by the same firm. The two forms of energy have been combined so that each is said to correct the defects of the other. The oil engine is kept cool by the steam, while the heat of the steam section is increased by the oil engine. An engineer states that the saving in fuel and water is considerable, although the cost of the oil-steam locomotive is fifty per cent greater than that of an ordinary steam engine. The cost, however, is only half that of a Diesel electric engine of similar capacity.

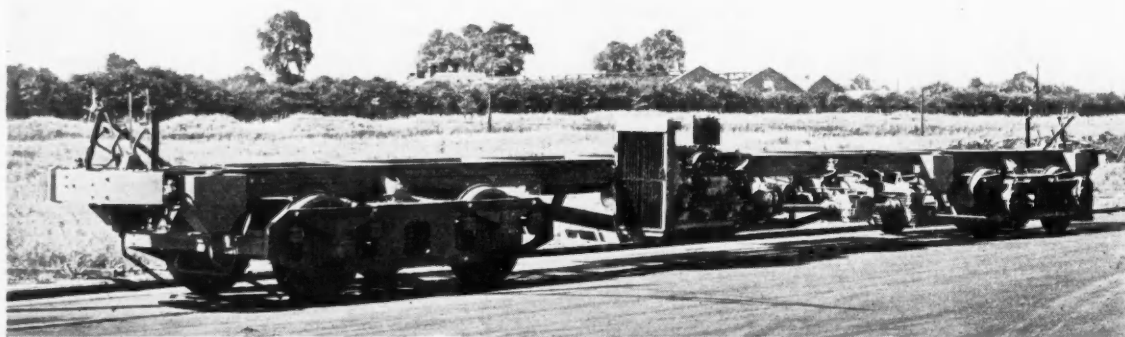
The Associated Equipment Company, builders of the London buses, have also turned their attention to oil engines for railway trains. They have just introduced a streamlined railcar which will carry seventy-eight persons and whose weight per passenger is approximately half that in the average suburban train.

A feature of the chassis is the fact that the

driving unit is mounted on the side of the framework so that every working part may be removed for examination without disturbing the body. The radiator is mounted in the usual position adopted in motor cars, and cool air passing under the car is diverted by means of an automatic deflector into a pocket placed in front of the radiator, whence it is drawn through tubes by means of a fan. Hot air from the radiator and the engine escapes at the side of the body. The body consists of one long saloon with a central entrance, and as in other modern locomotives special attention has been paid to streamlining; as a result of wind-tunnel experiments a design has been perfected which at sixty miles an hour will require approximately one-fifth of the power to overcome wind resistance that a square-ended body of the same area would need.

It is pointed out that the consideration of wind resistance, and hence the need for streamlining, is of far greater importance in a railcar than in a train. In the latter the frontal area is only about one per cent of the side area, and wind resistance is therefore negligible compared with "side thrust." On the railcar, however, this proportion is about fifteen per cent.

By taking full advantage of the saving in power which results from low weight and streamlining, a comparatively small engine is employed, with considerable saving in initial cost and running expenses. Even so, the ratio of about five horse-power per ton of weight when the car is laden compares favourably with an express train weighing from five to six hundred



The chassis of the Diesel Oil Railcar built by the Associated Equipment Company.



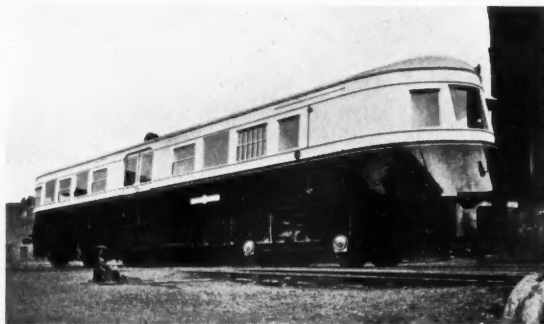
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The Diesel Electric "Railbus" designed for high speed service by Armstrong-Whitworth.

tons and hauled by a fifteen hundred horse-power steam locomotive.

An interesting constructional feature is the fact that, since all the driving units are outside the framework of the chassis, the design may be altered to suit various rail gauges with the least possible modifications. The controls are duplicated so that the train may be driven at the same speeds from either end. Drum brakes are fitted inside the wheels, and sand is provided to assist in braking as well as in starting in either direction. All the driving units are placed below the floor level and do not therefore occupy any body space. The sides of the body are extended down as far as possible so that they provide the necessary protection for the driving units as well as maintaining a smooth exterior surface which is essential for efficient streamlining.

The railcar is driven by a 130 horse-power high-speed oil engine which in the course of tests has already covered 10,000,000 miles on the road. The engine has six cylinders and, with flywheel and accessories, weighs 1,414 lbs. A long series of experiments has led to the development of a combustion chamber which results in more efficient and cleaner combustion and an economy in the use of fuel.

A maximum speed of 110 miles an hour is expected from a new streamlined train designed for use on the Union Pacific Railway of America, and described in the American journal *Popular Science*. The average speed is expected to be about a mile a minute. The train carries 119 passengers besides mail and baggage, and the three coaches form a single streamlined unit weighing no more than an ordinary Pullman. It is driven by a sixty horse-power internal combustion engine generating electricity in the nose of the foremost coach. Sealed "shatter-proof" windows and special air conditioning apparatus eliminate all dust and noise. The new train is expected to be in regular

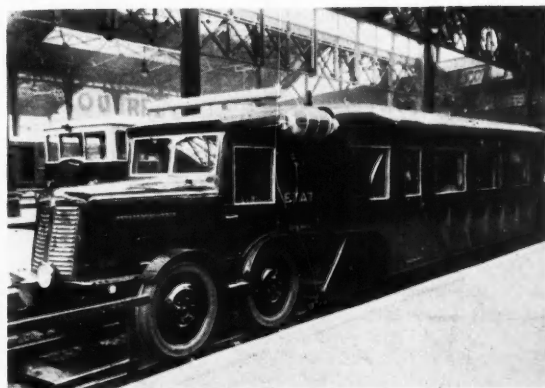
service within six months; at first it will be used on short routes, but later it will be put into service on the trans-continental railways.

An even greater speed has been reached by a new "bullet" railcar in Paris. A single coach is driven by four 200 horse-power racing motor engines, and will travel at a speed of 115 miles an hour. It carries fifty-two passengers and at top speed covers two and a half miles on a gallon of petrol. In the same class is a German train which reaches 100 miles an hour between Berlin and Hamburg, while an Austrian railcar, which has a combination of pneumatic tyres and standard railway wheels and is capable of ninety miles an hour, has lately been shipped to America for tests on the Long Island Railroad.

An all-aluminium train was exhibited for the first time at the Chicago World's Fair this year. Even the trucks are of solid aluminium so that it weighs twice as much as a normal sleeping car. The temperature within the car is automatically regulated by thermostatic control, warming the filtered air in winter and cooling it in summer.

One of the most spectacular feats of modern railway engineering is the mountain track which runs for 100 miles along the peaks of the Sierra and Cascade ranges in northern California. It is a mile above sea level and its construction has involved hacking away mountain peaks and tunnelling through them, filling in chasms and bridging them with gigantic trestles.

This railway was built in record time with the aid of ingenious machines and its heaviest gradient is only 2.2 per cent. In three or four minutes three men and four machines were able to do what twenty years ago would have occupied forty labourers, fifty mules and twenty-five old-fashioned "scrapers" for two hours.



[E.N.A.]

A French Railcar with a racing motor engine. It is fitted with rubber tyres.

Book Reviews.

Evolution of Habit in Birds. By EDMUND SELOUS. (Constable. 10s.).

A book by Mr. Selous is an event. Mr. H. J. Massingham, in his introduction to this volume, says, "I have never read an author who so intuitively understands . . . why birds act as they do nor one who has given himself over with such single-minded zeal to the intimate scrutiny of their habits, natural, spontaneous and of everyday." This is perfectly true, but as Mr. Massingham also remarks, Mr. Selous is "at times an extremely difficult writer" owing partly to his style's "unwieldiness and spate of parenthesis." The fact that his work has not received, at any rate in England, all the recognition which it deserves is, we believe, due as much to these defects as to the antagonism of the "museum mentality," with its classification complex. In the preface the author recounts the rejection of his books for want of system or because of length. With the latter objection we feel sympathy. Condensation would improve this book, "but," Mr. Selous says, "my notes are my autobiography. . . . They are a natural birth and I will not abort them."

Every page of this book is interesting from its closeness of observation of live birds in the field—not in museums. In two chapters, entitled "Are Birds Really Landed Proprietors?" the author maintains that the behaviour from which the territorial theory is inferred was founded on the sexual impulse—far more fundamental than the territorial one. Out of this comes "jealousy which seeks sole possession of the object of it, and a nest, which . . . is almost included as a part of that object, so that privacy . . . is also desired." The nestal territory should be conceived as the nido-sexual vortex or maelstrom, for it is out of sexual impulses that first the nest and then the cleared area round it have come into being. The territorial, he admits, may have been developed out of the sexual. The cause of a bird's return yearly to the nestal area is primarily the memory of what took place there in previous years—the coital memory. The territorial sense is not a basic one, but the gradual resultant of actions such as the sexual and parental instincts and the law of self-preservation. The dividing line between territories is not territorial but personal; locality is not the main stimulus.

Mr. Selous illustrates his theory by numerous observations, some less favourable to it than others. He appears (see note p. 179) purposely to have abstained from reading Mr. Eliot Howard's *Territory in Bird Life*, wishing to base his conclusions entirely on his own observations. This is, perhaps, regrettable. Really the theories of these eminent field ornithologists are complementary. Mr. Howard's territorial theory does not entirely rule out the emotional factor, and both authors seem to agree that the object of fights between territorial owners is not the defeat of the intruder but its removal from a certain position. In fact, Mr. Selous admits that the question is open whether a true sense of territorial possession has not been developed in some birds beyond as well as out of the originating (i.e., "nido-sexual") factors, though on this point he suspends judgment. But this admission points to a probable solution.

Writing on "Formalization in Birds," Mr. Selous believes that certain martial actions of birds, due to sexual rivalry and once presumably intelligent, became through repetition the end in themselves. Swans, he thinks, have unconsciously and gradually substituted gyrations upon the water in the presence of an intruder for actual fighting—menace substituted for

victory. Natural selection has thus lessened the percentage of deaths and injuries in combats, to the benefit of the species.

In *The Realities of Bird Life* the author propounded the view that the nest originated in the impulse, forming part of the sexual frenzy, to pick up and drop sticks, leaves, etc., and in the rollings and scratchings which produce "scrapes" into which grasses and twigs fall. In this book he elaborates this theory; he concludes that the origin of nest building can never have been architectural; the original nest was an accidental conglomeration convenient for the laying of eggs.

Sexual display in birds he believes arose from their "anatomical posturings" due to erotic stimulus, but without guiding purpose, which passed gradually into display with the object of sexual union. In some birds the area surrounding the sexual organs is strikingly coloured, and attracts the other sex to "pre-coital sexual contacts." This suggests a developing sense of aesthetic appreciation. Space forbids our following the working out of this argument, but his conclusions deserve consideration, particularly his theory of the origin of the adornments of great crested grebes.

Various species that remove the excrement of the young from the nest sometimes swallow it and sometimes take it away. He believes that this cleansing is not the result of intelligent action but that the swallowing was originally gustatory. Our own observations convince us that some birds certainly drop and do not swallow the excreta. Parental feeding of the young he believes arose, e.g., in ground nesting birds with the active efforts of the young to appropriate food, and that the bringing of food to the young and afterwards to the nest evolved gradually and naturally from this.

The primary origin of song he believes to be erotic, though jealousy of rivals and pleasure have also played their part. He supposes the song of the nightingale to have started from the croak, but surely it is quite as likely to have grown from the high-pitched alarm note, which accompanies the croak, or from a combination of the two.

Mr. Selous writes rather bitterly of museum naturalists and pedantic ornithological systematists. With much of what he says we agree. In the future it will be through field observation of the natural actions and habits of birds that our knowledge of their minds will be enlarged. Systematism has had its day, but more good field work is being carried on now than Mr. Selous realizes. The recently formed British Trust for Ornithology, which hopes to do for field ornithologists what the Natural History Museum does for systematists, may, if conducted with sympathy and imagination, give valuable help in this direction.

The Place-Names of Northamptonshire. By J. E. B. GOVER, A. MAWER and F. M. STENTON. English Place-Name Society. Vol. X. (Cambridge University Press. 18s.).

The value and interest of the work that is being done by the English Place-Name Society becomes more obvious with every succeeding volume of its survey of the counties of England. The editors have now dealt with eight counties and, as the evidence accumulates, they are increasingly successful in interpreting difficult place-names and bringing out their historical significance. The Northamptonshire volume affords a happy illustration of the inferences that can be safely drawn from such a study, if topography and eutymology are both taken into account. The Romans had a settlement at Castor on the Nene, well-known for its pottery, and the site of a Roman villa

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with a mosaic pavement is probably indicated by the place-name Floore, near Weedon. History tells us little or nothing about the Anglian invasion, though Anglian burial-places have been found in the Nene valley. But the editors suggest that the Anglians settled there in the sixth, if not the fifth, century because place-names like Wellingborough, Orlingbury and Kislbury contain archaic elements. Northampton itself first rose to importance with the coming of the Danes in the ninth century. The county, it is held, represented the district held by a particular Danish army with its headquarters at Northampton. Yet the Anglo-Saxon population was not obliterated or expelled. The editors, by noting the distribution of distinctive Anglo-Saxon or Danish forms in the place-names, are able to show that to the west of Watling Street, which traverses the county from south-east to north-west, Anglo-Saxon names predominate, whereas to the east of the Roman road, and especially in the north-east of the county, Danish forms are numerous. This confirms to a remarkable degree the evidence of history, according to which Alfred, in making peace with the Danes, fixed Watling Street as the boundary of the Danelaw in this part of the East Midlands. The editors tell us that until about 1050 there were two counties known as Hamptonschire (Hamptunscir). Southampton began to be distinguished from the other about the year 980, but Northampton, to which a direct road led from the southern port, had to wait longer for its adjective of locality.

The treatment of the place-names, arranged by hundreds and by parishes alphabetically, is thoroughly scientific. Archives have been ransacked for early forms, and where no explanation is possible, the writers admit the fact and do not argue in the air or make wild guesses as so many people do. Particularly interesting are the cases in which an early Anglian form can be shown to have preceded a Danish form. Badby, for example, with its Danish suffix denoting a village, was, in a charter of the year 944, known as "Baddanbyrig" or "Baddanby." Naseby in Domesday is "Navesberie" and the Hnaef who gave his name to the place was definitely an Anglo-Saxon and not a Dane. A name like Geddington includes a Scandinavian personal name, Geiti, with an Anglo-Saxon suffix. Farthingstone and Maxey are similar cases. Finedon preserves the site of the meeting of the Danish "thing" or folk-mate. Systematic and intensive place-name study thus becomes a valuable aid to the historian, fascinating as it is in itself. We may draw attention, in conclusion, to the remarkable collection of field-names which the editors print. This was made with the co-operation of the children in the Northamptonshire schools and has yielded much instructive evidence. Similar work might well be done in other counties.

Peaks and Plains of Central Asia. By R. C. F. SCHOMBERG. With Colour Photographs by GEORGE SHERRIFF. (Martin Hopkinson. 15s.).

Colonel Schomberg gives us an account of two long trips, in 1927-29 and 1930-31, in the great province of Sin Kiang. Kashgar, Khotan, Yarkand, Aqsu, Urumchi, these are all well known, thanks to many travellers, but he tells us of the strange depression of Turfan, once the seat of the Uigurs, those tolerant, good-natured, cultured Turki before they were crystallized by Islam, and about the not very attractive district of Yuldüz and of the eastern and southern portions of the Tien Shan, all of which seem tolerably inhospitable, and have not often been described.

The author confirms the impression of the Sarts given by most travellers. He finds them colourless folk, without striking

vice or virtue. It is surprising that they are not only amenable but clean, and that they were horrified by the filth of Urumchi. It must have been bad. At the same time, he says that the chief motives of their actions are cowardice and cupidity. This may be the rule, but Nazaroff has shown that staunch courage is by no means unknown to them. Colonel Schomberg has a sneaking regard for the Kirghiz. He uses this word in an unusually accurate way, meaning the Kara Kirghiz and the mountain clans, distinguishing them from the Kasaks of the steppe, who are usually lumped together by Russian as well as English writers under the name of Kirghiz. This is odd, as he uses the word Turki as though synonymous with Sart, yet in the glossary he defines it as a Mahomedan native of Chinese Turkestan, thus excluding the several million of Turki peoples in Russian territory. In the same way he uses Mongol and Kalmuch as synonymous words. He brings out the great gulf between the educated Mongols, who have definite ideas of western education, and the plebeian mass, of whom he has nothing good to say. He does not tell us how they cook their *bifteck à la tartare* under the saddle, nor their staple diet of meat, flour and tea boiled together.

He described how one unfortunate result of the influx of firearms into Chinese territory from Russian as a result of the civil war in that country has been the threatened extermination of the wapiti. This would be a thousand pities, especially as the Central Asian races of this splendid deer are scarcely known to Zoology. The true wapiti is the *isibur* of Siberia, to which the name *maral* is often applied as well as to the more southerly species which ranges into Persia. Before the revolution, the Russian government encouraged maral-breeding for the sale of the horns in velvet, which found a good market in China as rejuvenating material. A good pair would fetch 300 roubles. The deer are not the only animals to suffer, as the author stresses the scarcity of animal life in the province, as well as the monotony of vegetable life. The same thing is occurring on the Russian side, where the revolution has made things worse, though its trouble is older. It dates from the unexplained exemption of Turkestan from the imperial game laws by tsarist officials.

Colonel Schomberg is an experienced and broadminded traveller, with a knowledge of Turki and Persian. He is not the sort to bore the reader with the tale of his discomforts and dirt: he tells us that one may live in comfort with the Kirghiz and with the Sarts; that the wealth of the cultivated portions of the country is immense, even without noticing the huge deposits of valuable minerals. He notes the strange uniformity of Central Asia, which is not interrupted even by the mountains for Nazaroff has told us that life and nature in Ferghana on the Russian side are indistinguishable from those of Kashgaria. In the remarkable story of the river Yangi Daria, which resumed its old bed abandoned a thousand years ago, with all the suffering involved on the population of the districts now condemned to desiccation, we see an epitome of the history of Central Asia. In spite of this example, he is an optimist for the future of the country. Stein has shown that the total volume of water available for the use of mankind is limited to the capital supply stored in the surviving glaciers of the surrounding mountains. Shrinkage has undoubtedly reduced the habitable area, and so led to the preservation under the sands of Takla Makan of the ancient cultures revealed by Stein. Schomberg thinks, however, that with proper engineering, this great region may yet afford a home for expanding mankind as a relief to the overcrowding of east, west and south.

Modern Mountaineering. By GEORGE A. ABRAHAM. (Methuen. 7s. 6d.).

A great climber and a practised writer, Mr. Abraham is the right man to speak of modern mountaineering, and his new book can be commended to all who are interested in the sport. He devotes the first half of the book to the Alps and then gives a chapter apiece to the Lakes, North Wales and Scotland. Chapters on rock-climbing, which is the author's speciality, on snow and ice craft and on equipment complete a thoroughly practical book. The many illustrations are, for the most part, as useful as the text. It is noteworthy that Mr. Abraham, who has climbed the most terrifying rock-walls for many years without an accident, repeatedly insists on the need for caution. To old-fashioned climbers some of his early performances on Great Gable and elsewhere seemed hazardous in the extreme, but in this book Mr. Abraham is found condemning the reckless foolhardiness that results every season in loss of life, whether in Switzerland or nearer home. He is not inconsistent. The strong and agile man with a cool head and a capacity for taking pains can do the worst British rock-climbs with very little risk; unhappily not all who try to follow in Mr. Abraham's footsteps or to find new routes that even he avoided possess his special qualities, and thus accidents happen. In the Alps avalanches and exhaustion due to cold and fatigue are the prime causes of most disasters, and it is usually the guideless climbers who have spurned the advice of the experienced natives, who come to grief. Mr. Abraham's wise comments on this question will probably be disregarded by rash youth, but they deserve attention none the less. His Alpine chapters are particularly fascinating and include the very latest details as to notable peaks.

The New Background of Science. By SIR JAMES JEANS. (Cambridge University Press. 7s. 6d.).

This is one of the best books we have had from the facile pen of Sir James Jeans. Presumably it is to be regarded as a "popular book"—certainly it will be a "best seller." It sets forth the modern position in physics admirably. It is of value to the physicist because it enables him to view the subject as a whole and to clear up his mental state with regard to the general position quite apart from the particular aspect which may have been his special study. One of the greatest drawbacks to the professional study of atomic physics to-day is that the part assumes so large an aspect that there is a real danger of forgetting that the whole exists. Thereby much of the beauty of one's work is lost, to say the least of it. The layman will find the book enchanting even if he finds it a little difficult to read. Atomic physics may be to some extent explained in popular language if the exponent is skillful and learned enough, but the necessary concepts cannot be put into nursery words—some effort on the part of the reader is required. Sir James Jeans has made a valuable and noteworthy contribution to the subject of modern physics which he has endowed with some of the mystery and excitement of a very first rate novel.

Man's Adaptation of Nature. By P. W. BRYAN. (University of London Press. 16s.).

Dr. Bryan's theme is that human activity, "which takes place in order to satisfy human desires," adapts and modifies nature, thus changing the natural landscape. "Because of its very nature," he writes, "the cultural landscape, including

man, is the objective expression of the relationship between human activities and natural environment." The book attempts an analysis and classification of the features of the cultural landscape, suggests methods of studying them, discusses natural environment in relation to them, and in a series of detailed studies examines in relation to environment the cultural landscapes of selected activities and areas.

Dr. Bryan suggests two possible methods of approach in the study of human geography. We can approach it from the standpoint of the natural region regarded as the home of man; we then begin by studying the natural region as a geographical area. The other approach takes up the study of the distribution of man and his activities in relation to the natural environment in which those activities take place. In this case our approach is definitely from the side of man, the region being used to explain the relationship which exists between him and the physical setting. The author thinks that human geography thus conceived has a future, for more than any other science, it gives us an insight into man's activities in relation to the earth on which he lives.

Scientific Theory and Religion. By ERNEST WILLIAM BARNES. (Cambridge University Press. 25s.).

This book, by the Bishop of Birmingham, is chiefly concerned with an encyclopædic account of modern scientific views, ranging in subject matter from relativity to biology and taking the inevitable wave mechanics in its stride. Having regard to the title, the first part of the book is too detailed and is unsuitable for general reading. Probably there is nothing particularly original in the early lectures, and therefore much of the subject matter would even appear to be out of place in such a volume. The greater part of the book is made up of scientific information well known to the appropriate specialists, and therefore it is of no particular value to them here as a means to assess the validity of religious experience. On the other hand the language is too technical to afford assistance to the non-specialist. But these lectures are certainly a monument to persevering hard work on the part of the author in gathering together such masses of diverse scientific information. In particular Dr. Barnes' mathematical erudition is shown to the fullest advantage even though his pastoral orthodoxy may suffer slight obscurity by the way.

In the later lectures the main thesis is developed in a more definite manner, although it is by no means clear to what philosophical position the Bishop desires to lead us. The official position of the author would suggest to the unwary reader that some definite form of Christianity would emerge triumphant as a result of his critical study of contemporary learning. However, the author does not commit himself to anything so tangible, but out of a somewhat evasive system of Unitarianism contrives to present true Christian worship as the antithesis of bad taste, evasion, and hypocrisy. (Page 626.) There is no doubt about the intense sincerity of the author. Nevertheless the note of passionate desire for truth is combined with a certain intolerance of some formal religions, which serves to add a piquant spirit of unrest to the erudite speculations which inspired the Gifford Lectures of 1927-29. With the lawyers we may say, *Summa ratio est quæ pro religione facit.*

The programme of extension lectures just published by the University of London, includes a course of lectures on "Man and the Physical World" to be given by Dr. A. C. R. Wakeman at Gresham College this autumn.

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